From Macro Totals to Household Distributions:
Advancing the National Accounts with Inequality Metrics

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"We do not receive wisdom, we must discover it for ourselves, after a journey through the wilderness which no one else can make for us."

— Marcel Proust

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Contents

Introduction

Current Understanding of Inequality

Economic inequality—whether in income or wealth—is increasingly recognized as more than a matter of material distribution. A growing body of interdisciplinary research highlights that inequality deeply influences individual well-being, institutional trust, and social cohesion (SCP, 2023; Mijs, 2021). Despite this recognition, existing measurement practices often omit major components of household resources—such as in kind transfers, pension wealth and retained earnings—thereby limiting both our understanding of inequality and the effectiveness of policy responses.

One of the most consistently observed consequences of economic inequality is its impact on subjective well-being. While some studies report a positive relationship between income inequality and well-being (Rözer & Kraaykamp, 2013; Berg & Veenhoven, 2010), the majority of research suggests that income inequality tends to lower average happiness levels—a finding supported by a broad range of cross-national studies (Verme, 2011; Delhey & Steckermeier, 2020). This is further underscored by Wilkinson and Pickett (2009), who demonstrate that greater income inequality is associated with a wide range of 'social ills' — such as poor mental health, reduced trust, and lower social cohesion. More recently, Lous and Graafland (2022) go beyond average effects and show that the negative relationship between income inequality and life satisfaction is particularly pronounced among individuals in the lowest income quintiles, while also remaining significantly negative for higher income groups. Disparities in material resources are strongly linked to diverging perspectives on well-being, political efficacy, and societal fairness (Hoff *et al.*, 2021), and policy research for the Netherlands finds that socio-economic separation across schools, neighborhoods, and workplaces has weakened mutual understanding (SCP, 2024).

It is not only the extent of inequality but also how it is perceived that shapes societal impact. Individuals' sense of social status is influenced as much by perceived fairness as by measured inequality (Mijs, 2021; Hajdu, 2025). Inequalities that are perceived as illegitimate have particularly adverse social and psychological effects. Disparities from inheritance or passive capital gains are broadly considered more unjust than those based on effort or merit (Mijs, 2021; Ugur, 2021), shaping attitudes toward redistribution and institutional trust. Yet, Dutch citizens misperceive the distribution: they tend to overestimate income inequality while underestimating wealth inequality, revealing a marked disconnect between perception and statistical reality (Douenne, Sund, & van der Weele, 2024).

The economic literature identifies contrasting theoretical channels through which inequality may affect economic growth. While classical models argue that inequality may encourage effort and investment through higher returns (Mirrlees, 1971; Lazear & Rosen, 1981) or increase aggregate savings (Kaldor, 1955; Bourguignon, 1981), more recent frameworks emphasize its growth-dampening effects. High inequality reduces investment in human capital (Galor & Zeira, 1993), limits domestic demand (Krueger, 2012), and fosters political instability (Alesina & Rodrik, 1994; Persson & Tabellini, 1994). OECD analysis (OECD, 2015) shows that inequality, particularly when concentrated among the bottom 40%, consistently lowers GDP growth. A two-point increase in the Gini coefficient is linked to a 4.7 percentage-point reduction in GDP growth over 25 years, largely due to constrained human capital development (Cingano, 2014).

Despite modest increases in primary income inequality, the Netherlands maintains relatively low disposable income inequality due to strong redistribution. Caminada *et al.* (2021) report that the Gini coefficient for primary income reached 0.544 in 2019, dropping to 0.292 after taxes and transfers—a reduction primarily driven by pensions, taxation, and social benefits. In contrast, the Interdepartementaal Beleidsonderzoek (IBO) on wealth distribution reveals pronounced wealth disparities (Ministerie van Financiën, 2022). The top 1% benefit most from capital gains, low effective tax rates, and intergenerational wealth transfers, reinforcing inequality through self-reinforcing mechanisms. These trends highlight an imbalance in the taxation of labor versus capital income.

Wealth inequality may have even more severe implications than income inequality. High wealth inequality is associated with lower aggregate demand, reduced entrepreneurship, and declining intergenerational mobility (Stiglitz, 2012; Piketty, 2014). Emerging research (Kumhof *et al.*, 2015; Saez & Zucman, 2019) also links wealth concentration to financial instability and political polarization. Such findings reinforce the idea that inclusive growth is incompatible with unchecked wealth inequality.

International comparisons reinforce the Netherlands' paradoxical position: it ranks among the most equal OECD countries in terms of income but shows high levels of wealth concentration (OECD, 2015). Similar patterns are observed in Austria and Germany. Van Bavel and Frankema (2017) describe this as the 'welfare paradox,' stemming from the exclusion of publicly funded pension entitlements from wealth concepts used in inequality statistics. Although many redistributive schemes—such as pensions and social benefits—are incorporated into income measures, they are typically omitted from wealth statistics, leading to an incomplete picture of household economic positions. This highlights the limitations of conventional measures and the need for more comprehensive accounting frameworks.

Government intervention through progressive taxation and social protection remains central to addressing inequality (Piketty, 2014). In the Netherlands, redistribution through taxes and transfers significantly reduces income inequality (Caminada *et al.*, 2021). Yet concerns persist about declining progressivity, particularly regarding capital income and wealth taxation (Ministerie van Financiën, 2022). Labour income is taxed more heavily than capital, and inheritance structures perpetuate intergenerational advantages. As a result, policy discourse increasingly calls for tax reform to ensure structural fairness and broaden the redistributive base (SCP, 2023). The design of the tax burden—both in terms of rates and exemptions—is therefore central to the government's capacity to ensure economic justice and intergenerational fairness.

While most inequality research focuses on cross-sectional outcomes by income or wealth group, this thesis also addresses distribution over the lifecycle—an important yet underexamined dimension. This dimension becomes increasingly relevant in ageing societies, where the sustainability of social schemes is placed under pressure by demographic change. As population ageing shifts the balance between contributors and beneficiaries of welfare systems, it is vital to understand how redistribution functions across generations. This study contributes to that understanding by analyzing how economic resources and redistribution vary across age cohorts within a national accounting framework, offering a more comprehensive and intertemporal view of inequality.

Identified Gaps in Knowledge

A key limitation in the present state of economic statistics is that distributional measures are not embedded in the national accounts, the central macroeconomic framework used to assess economic activity, income, and wealth. While the national accounts provide coherent, exhaustive, and internationally comparable aggregates, they offer no insight into how these resources are distributed across households or demographic groups. As a result, there is a fundamental disconnect between the macroeconomic indicators that dominate public discourse—such as GDP, national income, or disposable income—and the distributional outcomes that determine people's material well-being.

Most efforts to bridge this gap have focused on income and wealth inequality, but the absence of demographic dimensions—such as age or lifecycle stage—is equally limiting. These characteristics are essential for analysing challenges such as population ageing. Yet, the current framework of national accounts lacks the demographic granularity needed to evaluate how economic resources are distributed across age groups.

The national accounts are designed to be exhaustive, capturing the full scope of economic activity—including both observed and non-observed components—while ensuring consistency, such that income, production, and expenditure align within a coherent macroeconomic framework. The exhaustiveness of the national accounts is reflected in the inclusion of income components that are typically absent from household income concepts in microdata. For example, they include estimates of income earned in the informal economy, as well as imputed flows such as investment income payable on pension entitlements. They also capture certain current taxes and transfers between households or with non-profit institutions serving households, such as contributions and gifts, that are absent in the current micro statistics on income and income inequality. Moreover, in-kind transfers—such as public education, healthcare, and other social services—are almost entirely excluded from these micro statistics, despite their central role in income redistribution. This omission limits the ability to evaluate the redistributive impact of government policy across the income distribution, and across different age groups, since many such services are age-targeted. Considering wealth, occupational pension entitlements, which represent the largest component of household net worth in the Netherlands, are typically left out of wealth statistics.

In the national accounts, consistency is ensured by recognising that the resources of one sector are, by definition, the uses of another: the income received by households corresponds to expenditures made by firms, governments, or the rest of the world. Likewise, household assets are mirrored by the liabilities of other sectors, reflecting the integrated nature of the economy. This creates discrepancies between the levels of income, consumption, and wealth reported in the national accounts and those found in underlying microdata for households, with the former generally regarded as more reliable. Consumption provides a particularly illustrative example: national accounts figures diverge significantly from household survey totals, especially at the aggregate level. Consequently, the national accounts provide a more accurate basis for assessing household saving rates.

In sum, addressing these limitations requires extending the national accounts to include distributional information along multiple axes: not only income and wealth groups, but also demographic dimensions such as age. Only then can macroeconomic statistics support a fuller understanding of both current inequality and long-term demographic challenges.

Research Questions

This thesis explores how inequality is measured, interpreted, and reshaped when it is embedded within the macroeconomic framework of the national accounts. Traditional analyses of inequality often rely on microdata from household surveys, or in the case of the Netherlands administrative data, which, while detailed, do not align with macroeconomic aggregates or concepts. When income concepts differ, outcomes for inequality are likely to differ as well. By integrating distributional information into the national accounts, this research investigates how measures of inequality change, what drives these changes, and what implications this has for understanding the structure and evolution of economic disparities. The following research questions are addressed across the four core chapters of the thesis:

Chapter 1 examines how income inequality changes when it is measured within the System of National Accounts (SNA). It asks: *To what extent do inequality levels differ when derived* *from microdata versus when constructed consistently with national accounts?* This chapter also investigates the underlying drivers of these differences, such as conceptual mismatches, population scope, and data gaps, and compares the Dutch results with experimental results from twelve other countries to explore the international variation in inequality as measured within the macroeconomic framework.

Chapter 2 shifts the focus to wealth inequality. The central question is: *How does the inclusion of (public and private) pension entitlements affect the measurement and interpretation of wealth inequality?* This chapter considers how incorporating a broader range of welfare state components alters the view of wealth inequality. Furthermore, it explores how a joint analysis of income and wealth distribution can enrich the understanding of economic inequality, moving beyond one-dimensional metrics.

Chapter 3 broadens the analytical lens from the household sector to the national economy as a whole. The question here is: *How is income distributed in the population, and how do different social groups contribute to public revenues and benefit from government expenditures?* This chapter explores how effective tax rates and redistribution can be analysed in a framework where the national income is allocated to households, including income generated in the corporate sector, with particular attention to the substantial role of retained earnings at the top of the distribution.

Finally, chapter 4 turns to inequality as it emerges across age groups, rather than income and wealth inequality. While some degree of inequality follows a normal pattern over the lifecycle—as individuals typically earn more in midlife and save for retirement—demographic change increasingly alters the structure and magnitude of these economic flows. Labour income, consumption, and the tax-benefit system all exhibit distinct age profiles, and in ageing societies these flows interact in increasingly complex ways. This introduces a generational dimension to inequality, raising the question of how economic growth is distributed not only across income groups, but also between age cohorts. In particular, this chapter addresses the question: *"How can we integrate age-specific distributions into the national accounts to capture the effects of population ageing on household income and economic flows?"* Just as traditional national accounts are limited in capturing the distribution of income and wealth, they are equally unsuited to tracing how economic resources are allocated across different stages of life. This chapter adopts a more methodological perspective than the others by integrating the national accounts framework with the National Transfer Accounts (NTA) system, employing it as an analytical tool to examine the economic implications of demographic change.

Together, these questions form an integrated research agenda aimed at developing a richer, more coherent understanding of inequality by embedding it within the national accounting framework, offering both methodological contributions and substantive findings that are relevant for policy, statistics, and public debate.

Approach of the Thesis

The groundwork of this thesis is a comprehensive, micro-founded database of household income, consumption, savings and wealth. Building on the methodology pioneered in Bruil & Barb (2014), and Bruil (2018), this work combines detailed administrative and survey data with macroeconomic aggregates from the national accounts, enabling the full allocation of all economic transactions of the sequence of national accounts to individual households.

The construction of distributional national accounts begins with a precise delineation of the target population. In line with the national accounts framework, the analysis primarily focuses on the household sector, defined to include all households residing in the Netherlands. To construct the population of the household sector, we use census data[1] that provide a complete record of individuals registered on both the first and last day of the year. Each individual record includes key background characteristics—such as gender, birth date, country of origin, household position, and an encrypted social security number—which enable precise linkage across data sources and the aggregation of individuals into households. Population dynamics within the year are captured by identifying immigrants as those present on December 31st but not on January 1st (and born before the reference year), and emigrants as those present on January 1st but no longer registered at year-end,

[1] Although the term 'census' is not strictly accurate in the Dutch context, where population data are drawn from administrative registers rather than survey enumeration, we use the term here for ease of understanding and consistency with international usage.

provided they have not died. Deaths during the year are accounted for using mortality data. While this approach does not capture intra-year movements (e.g. individuals who both immigrate and emigrate within the same year), it provides a consistent and operational definition of the household population. For the derivation of household-level characteristics—such as household composition—we use January 1st as the reference date, recognising that events such as births, deaths, and migrations throughout the year may affect these characteristics, but that this limitation is inherent to any fixed-date reference system.

A key feature of the approach is its integration of multiple data sources to cover the full spectrum of income, taxes, and transfers. These include administrative records from tax and social insurance authorities, housing and ownership registries, national care and education databases, and detailed micro-level income and wealth statistics. Survey data—such as the Household Budget Survey and LISS panels—are used to supplement components not fully captured in administrative records, particularly for consumption and smaller transfer items. Data are ideally linked at the individual level through unique (anonymized) identifiers, which allows for consistent aggregation to the household level and accurate assignment of economic flows across the population. Where direct matching is not feasible, linkage is achieved by imputing values based on observed common attributes.

The framework explicitly aligns micro-level variables with national accounts levels, following the proposed and harmonized methodology in the OECD Handbook on the Compilation of Household Distributional Results on Income, Consumption and Saving in Line with National Accounts Totals (OECD, 2024). As with any effort to integrate micro and macro data, significant gaps remain between micro-level reporting and national accounts totals. These gaps are addressed in two steps. First, imputations are made for missing or underreported income components using auxiliary sources and distributional assumptions. Second, proportional adjustments are applied to align micro-level aggregates with their corresponding macroeconomic totals, ensuring that the distributional results remain consistent with national accounting constraints.

The result is a comprehensive database with over 17 million records per year—one for every individual in the country. For each person, detailed background characteristics are available, along with a household identifier that allows individuals to be grouped into households. Each record also contains the income, consumption, and wealth components attributed to the individual or their household. This database is central in chapter 1.

Pension entitlements are among the wealth components included in the database, enabling us in Chapter 2 to examine their impact on inequality. In addition, we extend the concept of net worth by incorporating public pension entitlements, following the methodology outlined in the Technical Compilation Guide for Pension Data (Eurostat, European Central Bank, 2011) and its application to the Dutch context by Statistics Netherlands (CBS, 2015). This extension allows for a joint analysis of income and (extended) net worth, providing a more comprehensive perspective on household saving behavior.

In Chapter 3, we build on the existing database by incorporating more recent versions of the microdata and enriching it with additional datasets on in-kind transfers. Our analysis adheres as closely as possible to the Distributional National Accounts (DINA) guidelines developed by the World Inequality Lab (Blanchet *et al.*, 2021) to allocate national income across households. A key contribution of this chapter is the integration of data from the ownership registry of closely held firms, which enables us to include estimates of retained earnings in our inequality statistics. This addition allows for a more comprehensive assessment of income and the effective tax rate across the income distribution.

Chapter 4 builds on an earlier iteration of the database, reflecting a previous stage in its development. Although it includes fewer microdata sources, the analysis still centers on the distribution of resources within the household sector. In line with the National Transfer Accounts (NTA) approach, we adopt the individual as the unit of analysis, which required additional steps to allocate household-level values to individual household members. The age-specific breakdown of economic variables is derived from the database and integrated into a macroeconomic framework that connects detailed macro tables through accounting identities and ratio-based relationships. Using this framework, we developed four scenarios to analyse the effects of population ageing. Each scenario is based on a fixed value for household disposable income in 2025, treated as an exogenous variable. The projections focus on how these scenarios affect the distribution of household disposable income across different age groups. We apply a Bayesian methodology to ensure internal consistency of this extended framework.

Scientific Relevance

This thesis makes a novel and comprehensive contribution to the study of economic inequality by developing a nationally consistent, distributionally detailed household database for the Netherlands. Its core innovation lies in the integration of granular administrative microdata—beyond tax records alone—with the macroeconomic framework of the System of National Accounts (SNA). While the importance of reconciling micro- and macro-level data was already identified by Ruggles and Ruggles (1986) and Adler and Wolfson (1988), and further endorsed by the Stiglitz-Sen-Fitoussi Commission (2009), no empirical implementation has successfully achieved this alignment with such completeness and level of detail.

The household database developed in this thesis enables the construction of Distributional National Accounts (DINA) for the Netherlands, building on and advancing the work of Piketty, Saez, and Zucman (2018), and Garbinti, Goupille-Lebret, and Piketty (2018). The richness of Dutch administrative data allows for a more complete mapping of income, consumption, saving, and wealth to the household sector, while maintaining consistency with national aggregates. This represents a methodological improvement over earlier national attempts (e.g., Blanchet, Chancel & Gethin, 2022; Ederer *et al.*, 2022), which relied primarily on survey data and tax tabulations, limiting their insight into top incomes. By using population registers, ownership databases, social security data, and records of in-kind transfers, this study avoids many of the selection and measurement biases that have complicated earlier efforts.

This work also responds directly to debates in the inequality literature. The contrast between the DINA-based estimates of Piketty, Saez & Zucman (2018, 2024) and the critiques by Auten and Splinter (2024) illustrates the significance of definitional and allocative assumptions. Clarke and Kopczuk (2025) similarly argue that no single income concept can capture economic reality without controversial trade-offs. This study contributes to this debate by showing how results shift under different assumptions and by providing transparent sensitivity analysis throughout. Studies that ignore earnings retained within firms miss the predominant form of income of the rich, an issue that has previously been documented by a number of studies using corporate registries to assign retained earnings to individuals in Norway, Chile and Canada (Alstadsæter *et al.*, 2016; Fairfield and Jorratt De Luis, 2016; Wolfson *et al.*, 2016). The resulting statistics offer a more accurate view of inequality and tax incidence at the top.

Another scientific innovation of this thesis lies in incorporating pension entitlements—both public and private—into wealth distribution statistics. In countries like the Netherlands, occupational pensions constitute a substantial share of household wealth, yet are often excluded from inequality analyses (Van Bavel & Salverda, 2014; OECD, 2015). Previous Dutch studies (e.g., Caminada *et al.*, 2014; Kooiman & Lejour, 2016) have documented the equalizing impact of including second-pillar pensions but did so without full SNA consistency or inclusion of public pensions. This thesis improves on these approaches by using administrative data to calculate accrued pension rights in accordance with national accounting principles. International studies (e.g., Bönke *et al.*, 2019, 2020) have found that including pension wealth can reduce measured wealth inequality by up to one quarter; this study confirms such findings for the Netherlands and contributes to a harmonized methodological approach. This chapter supports the findings of Waldenström (2024), showing that the expansion of pension systems has had an equalizing effect in societies with strong social safety nets. It also sheds light on the “welfare paradox” discussed by van Bavel and Frankema (2017), helping to unravel its underlying mechanisms.

By doing so, this research also contributes to the global movement—supported by the OECD’s Expert Group on Disparities in a National Accounts framework (EGDNA)—to integrate inequality measures into national accounts. Several countries have published experimental statistics (e.g., ONS, 2015; Insee, 2017; Australian Bureau of Statistics, 2018; Statistics Canada, 2019; Stats NZ, 2018; Republic of Slovenia, 2018), and more recent efforts for France (André *et al.*, 2023) and the National Bank of Belgium (2025) have begun to align distributional indicators with administrative microdata and macroeconomic totals. This thesis is the first to systematically assess these developments in comparative context and to provide a full implementation of distributional accounts for income, wealth, and redistribution in the Netherlands.

Finally, this thesis extends the analysis of inequality beyond traditional household characteristics by introducing an age dimension to macroeconomic distribution. Chapter 4 contributes to the literature on National Transfer Accounts (Lee & Mason, 2011) by embedding age-disaggregated flows into the structure of the national accounts. This chapter adopts a more methodological perspective than the others by integrating the national accounts framework with the National Transfer Accounts (NTA) system, employing it as an analytical tool to examine the economic implications of demographic change.

Many forward-looking studies using the National Transfer Accounts (NTA) framework provide valuable insights into how demographic changes affect consumption, transfers, and public expenditures over time. However, most of these analyses operate in partial equilibrium: they project age-specific profiles into the future without embedding them in a broader macroeconomic system (Kuhn & Prettner, 2018; Mason & Miller, 2018; Mason *et al.*, 2022). Unlike many existing forward-looking NTA applications that treat households in isolation, this approach explicitly anchors these projections within basic macroeconomic constraints—such as government budget balances and aggregate resource limits—to ensure internal consistency and enhance the policy relevance of the results.

Societal Relevance and Policy Implications

Accurate and comprehensive measurement of economic inequality is essential for informed public debate and sound policymaking. In the Netherlands, as in many advanced economies, conventional statistics on income and wealth often omit key components—such as pension entitlements, retained earnings, or in-kind transfers. These omissions risk presenting an incomplete or distorted picture of inequality, potentially affecting policy design around tax fairness, intergenerational equity, and the sustainability of social protection systems.

Economic policy is shaped around the indicators we use to understand inequality. When micro-level data used to assess household well-being diverges from macro-level aggregates found in national accounts, the real distribution of the tax burden and the effectiveness of redistribution mechanisms may be misunderstood. This thesis contributes to bridging that gap. By aligning distributional statistics with national accounting totals, it provides a more transparent and consistent basis for analysing inequality.

The levels of income and wealth inequality presented here differ from conventional statistics and, as a result, challenge commonly held views in public discourse. Dutch citizens tend to overestimate income inequality while underestimating wealth inequality, revealing a striking mismatch between perception and statistical reality (Douenne, Sund, & van der Weele, 2024). Likewise, the results presented here contribute to revising two widely held views about the Netherlands: first, that it is a nation of savers, and second, that it has extremely high wealth inequality by international standards. This thesis shows that both impressions require nuance. By offering revised and nationally consistent estimates grounded in administrative data, it underscores the importance of accurate measurement for shaping debates on redistribution and institutional trust.

The chapters of this thesis each carry specific policy implications. Chapter 1 underscores the need for clarity about what income concepts measure, because differences in definition and coverage can materially change inequality levels and cross-country comparisons. Shifting from traditional microdata to national accounts-based inequality measures can lead to substantially different conclusions, with consequences for international comparability and policy evaluation. National statistics institutes and expert groups must therefore be equipped to further develop this statistics and communicate how methodological choices affect observed inequality outcomes.

Chapter 2 addresses the wealth distribution, highlighting the importance of pension entitlements—particularly public pensions—as the largest financial asset on household balance sheets. Their inclusion substantially reduces measured wealth inequality and provides a more accurate view of household financial resilience. Public pensions like the AOW support median and lower-wealth households, while occupational pensions benefit higher-income groups. A joint analysis of income, wealth, and savings—rather than income alone—enables more targeted, equitable policy design. Such an integrated perspective supports fairer taxation, better-targeted social protection, and stronger long-term planning in areas such as retirement, housing, and asset accumulation.

Chapter 3 draws attention to the importance of accurately measuring tax incidence. The finding that the corporate income tax is often the main levy actually paid by the wealthiest households supports efforts—such as those led by the OECD—for global minimum tax rates on corporate profits and effective taxation of billionaires. At the same time, the analysis shows that redistribution in the Netherlands occurs mainly through government spending, not taxation. This highlights the need for detailed, empirically grounded evaluations of how specific spending programs influence inequality.

Chapter 4 offers a methodological contribution by showing how an extended national accounting framework can capture the economic implications of ageing. Labour income, taxes, consumption, and transfers are deeply shaped by demographic shifts. The ability to trace these interrelated flows over the life cycle provides policymakers with insight into the fiscal and distributional consequences of an ageing society, helping them assess the sustainability of current systems and design effective long-term strategies.

By addressing these measurement gaps, this thesis contributes to a more transparent and consistent accounting of inequality in the Netherlands. A clearer understanding of who benefits from income flows and asset accumulation—not just on paper, but across macroeconomic systems—supports a more equitable policy response. It also strengthens the empirical basis for tax reform, redistribution, and planning in areas such as pensions, housing, and ageing. In doing so, this research enhances the capacity of both government and civil society to evaluate inequality in a way that reflects real-world conditions, and to act upon it with legitimacy and precision.

Outline of the Thesis

Chapter 1 presents the development of distributional national accounts (DINA) for the Netherlands, following the methodology of the Expert Group on Disparities in a National Accounts Framework (EGDNA). The central aim is to align income distribution statistics with the concepts and totals of the national accounts, offering a more coherent view of inequality and enabling better international comparisons. The study not only constructs such accounts for the Netherlands for the year 2016 but also compares the findings with those from 12 other countries to examine how inequality levels vary when measured within the framework of the System of National Accounts (SNA).

The findings show that income inequality in the Netherlands is substantially higher when measured in a way that is consistent with the national accounts. The Gini coefficient rises from 0.289 based on traditional microdata to 0.337 using the DINA approach. This increase reflects both improved coverage of income sources and differences in population scope. Redistribution through taxes, social contributions, and in-kind transfers significantly reduces inequality. For example, the income ratio between the top 20 percent and the bottom 20 percent drops from 14.3 in terms of primary income to 3.3 when adjusted disposable income is considered. However, effective tax rates, while around 35 percent for most of the population, fall to just 16 percent for the top 0.1 percent. When compared internationally, the Netherlands shows a relatively high level of inequality in primary income but also one of the strongest redistributive systems, particularly through public pensions and in-kind transfers. The integration of micro data into macroeconomic frameworks reveals important dimensions of inequality that are not visible in standard household surveys.

Chapter 2 addresses the underexplored but crucial role of pension entitlements in shaping wealth inequality. It responds to concerns that conventional wealth statistics exclude major components of household resources, particularly occupational pensions—thereby overstating inequality. The chapter constructs distributional wealth accounts for the Netherlands that are aligned with the System of National Accounts (SNA), reconciling detailed microdata from a range of administrative and survey sources with macroeconomic wealth aggregates. It develops an extended definition of household net worth by integrating first-pillar public pension entitlements (following a harmonized Eurostat-ECB methodology).

The analysis shows that including pension entitlements significantly alters the picture of wealth inequality in the Netherlands. Adding occupational pensions reduces the Gini coefficient from 0.664 to 0.604, while the subsequent inclusion of public pensions further lowers it to 0.521. The chapter also analyzes the joint distribution of income, wealth, and savings, revealing that many households face resource mismatches across these domains. In particular, it uncovers a large group of income-poor and wealth-poor households and finds that nearly half the population is dissaving. These findings call into question the perceived egalitarianism of the Dutch welfare state and help resolve the paradox of low income inequality and high wealth inequality.

Chapter 3 provides a comprehensive and nationally consistent analysis of income inequality and redistribution in the Netherlands, using a uniquely detailed set of administrative microdata linked to macroeconomic totals. Expanding on the analysis presented in Chapter 1, this chapter broadens the perspective from the household sector to the entire national economy, following the methodological framework of the Distributional National Accounts. It extends beyond household-level taxation and cash transfers by incorporating corporate ownership data, retained earnings, indirect taxes, and in-kind government spending—components typically omitted or approximated in prior studies. This methodological depth allows the chapter to produce the first exact estimates of effective tax rates and redistributive impacts for the full Dutch adult population, including the top of the income distribution.

This chapter presents four key findings. First, it shows that the Netherlands exhibits a moderate level of income inequality relative to other Western European countries, but that inequality is underestimated when retained corporate earnings—concentrated at the top—are excluded. Second, effective tax rates are flat across most of the population but drop sharply for the richest, as income shifts from taxable personal earnings to lightly taxed corporate profits. Third, redistribution through government spending—especially in-kind transfers like education and healthcare—plays a major role in reducing inequality, though conventional allocation methods tend to overstate its redistributive impact. Finally, inequality and redistribution vary significantly by age, gender, and region: gender disparities are notably reduced through redistribution, while regional gaps remain largely unchanged.

Chapter 4 introduces a novel methodology to assess the short-term effects of demographic change—specifically population ageing—within a national accounting framework. Unlike the previous chapters, which focus on inequality by income, wealth, or household characteristic, this chapter examines economic inequality through the lens of age. Building on the System of National Accounts (SNA) and extending the National Transfer Accounts (NTA) framework, the chapter combines microdata and demographic projections with macroeconomic aggregates to study the distribution of household disposable income by age. This approach enables a more policy-relevant analysis of how an ageing population affects labour income, consumption needs, asset accumulation, and public transfers. By constructing four economic scenarios for 2025 and applying a Bayesian estimation technique, the chapter generates consistent, age-specific accounts that trace how demographic change reshapes economic flows across the life cycle.

The results show a deteriorating lifecycle deficit across all age groups, highlighting increased reliance on asset income—especially among older cohorts—as labour force participation declines. For younger households, additional public transfers partially offset this gap, but the findings suggest that wage growth and fiscal adjustments (such as shifting taxes to the corporate sector) are necessary to sustain current living standards. Unlike traditional NTA projections that operate in isolation, this integrated framework links age profiles of economic transactions with broader macroeconomic accounts—including government, and production accounts—making it potentially suited for real-world policy analysis. Overall, the chapter offers a forward-looking tool for analyzing the interaction between ageing and economic distribution, aligning with Stiglitz-Sen-Fitoussi's call to move beyond GDP toward more inclusive measures of well-being.

Concluding Remarks

This thesis has demonstrated how embedding distributional information within the framework of the national accounts significantly enriches our understanding of economic inequality. Traditional inequality measures often rely on survey or administrative data that are not consistent with macroeconomic aggregates. By contrast, this work uses the national accounts as a coherent and internationally comparable reference system—one that is exhaustive, internally consistent, and capable of capturing the full structure of economic activity.

While this alignment offers a powerful analytical foundation, it also entails limitations. Known inaccuracies in the national accounts—such as the long-standing underestimation of the value of non-listed shares—must be accepted until officially revised. Better information, even when available, is only incorporated once it becomes part of an official update. This constraint reflects the importance of maintaining alignment with the national statistical system, but it also highlights the need for more agile revision practices and complementary experimental statistics.

The use of national accounts also leads to conceptual challenges at the micro level. For example, households with large debts can appear relatively poor in microdata due to high interest payments. However, under national accounts conventions, a portion of those interest payments is reclassified as consumption of financial services indirectly measured (FISIM). This results in a higher disposable income for the household, potentially shifting their position upward in the income distribution. Although their savings are unaffected—since both income and consumption rise equally—this discrepancy between micro and macro concepts raises important interpretative questions.

A further illustration comes from Chapter 2, where some households experience large one-time financial transactions that are subject to personal income taxation. In the national accounts, only these taxes are recorded in disposable income, while the financial transaction itself is captured in the financial accounts. The result can be households with high wealth but negative disposable incomes. Such patterns show that aligning microdata with national accounts can produce counterintuitive outcomes at the individual level—outcomes that are methodologically correct, but require careful interpretation. These are not just technicalities: they are vital to understanding what inequality statistics based on national accounts actually tell us. As such, these issues deserve thorough discussion in the international expert groups working on distributional measures.

Chapter 4, while distinct in focus, fits conceptually within the same framework. It presented a methodology to analyse the short-term effects of demographic change—particularly population ageing—on household income distributions within the national accounts. By integrating micro-level age distributions into a macro framework, we could trace how demographic shifts alter economic flows and highlight growing lifecycle deficits. Although methodologically different, this chapter shares the core premise of the others: that macroeconomic analysis benefits greatly from integrating disaggregated, distributional information.

In reflecting on the scenario design, it is important to acknowledge that the population and GDP growth assumptions we used in Chapter 4 were deliberately chosen to span a wider range of possible demographic and macroeconomic developments than official projections. In hindsight, both GDP and household income growth were underestimated, particularly because population growth, as a result of high migration, turned out to be stronger than anticipated. However, this does not undermine the validity of the scenario analysis. The purpose of the scenarios was not to forecast future levels of economic aggregates, but to explore how demographic change—especially population ageing—affects the distribution of household disposable income across age groups. For that reason, we held household income constant across scenarios. While this may appear inconsistent with varying GDP trajectories, it ensures comparability by isolating the effects of demographic composition. The scenarios are thus analytically consistent for the aim at hand: understanding how ageing reshapes the generational distribution of income. Future work could enrich this approach by integrating behavioural responses or allowing for endogenous variation in income levels, but for the present analysis, the fixed-income approach serves as a transparent and effective tool.

There remains considerable scope for improvement and further research. In line with Clarke and Kopczuk (2025) it is emphasized that the choice of income concept plays a crucial role in inequality measurement, noting that no single dataset can fully capture all components of a given income definition. Despite the richness of administrative and survey data used, data gaps remain—particularly in the non-observed economy, non-market flows, and by fully aligning with national accounts concepts. Continued progress in these statistics relies on better data availability and methodological refinement, supported by collaboration within the international expert group structures.

Longer time series would also enhance analytical value. Not only would they allow researchers to trace inequality trends more robustly, but they would also offer deeper insights into the taxation of retained earnings—particularly the lag between income accumulation in firms and eventual payouts to households. This is essential to understand the true incidence of corporate income taxation and to assess how deferred income flows affect long-term inequality measures.

It should be noted here that each chapter in this thesis was developed at a different point in time, reflecting both the iterative nature of the research process and the evolving state of data availability and methodological insight that came with this process. As a result, certain modelling choices—such as the allocation of mixed income into labour and capital components, or the equivalence scale applied to convert household-level consumption into individual-level estimates—were not fully harmonised across all chapters. With the benefit of hindsight, greater consistency in these technical choices would have strengthened the comparability of the results. Moreover, the analysis in Chapter 4 could have been enriched by the more advanced understanding of microdata construction and alignment developed in the earlier chapters. These limitations are acknowledged as part of the learning process and point to opportunities for refinement in future research.

Taken together, this thesis shows that integrating distributions into the national accounts is more than a technical improvement: it is a conceptual shift. It opens up new ways to understand who earns, owns, and benefits from economic activity—across income brackets, asset classes, and generations. By doing so, it lays the groundwork for more informed public debate, better statistics, and ultimately, more equitable economic policy.

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Chapter 1

1. Distributional National Accounts for the Netherlands and a Comparison with 12 Other Countries

This chapter is based on Bruil, A. (2023). Distributional national accounts for the Netherlands and a comparison with 12 other countries. *Review of Income and Wealth*, *69*(4), 886-906.

1.1. Introduction

Driven by the Report by the Commission on the Measurement of Economic Performance and Social Progress (Stiglitz, Sen, & Fitoussi, 2009), more attention has been paid to the inclusion of distributional measures in the System of National Accounts (SNA). This is also in line with the Data Gaps Initiative (Financial Stability Board, 2009), which stresses the need for indicators that capture better households' well-being, supplementing the macro aggregates of the SNA framework.

Recommendations in these reports were followed, among other initiatives, by the Expert Group on Disparities in a National Accounts framework (EGDNA). This group aims to produce measures of disparities in income across different household groups, which are consistent with national accounting concepts and totals, following a harmonized approach (Fesseau & Mattonetti, 2013). Even though many countries participate in the Expert Group and the importance is acknowledged by national statistical institutes (Vienna memorandum, 2016), only a few of those, among which Statistics Netherlands (2019a), started publishing results of these breakdowns (Office for National Statistics, 2015; Insee, 2017; Australian Bureau of Statistics, 2018; Republic of Slovenia Statistical Office, 2018; Stats NZ, 2018; Statistics Canada, 2019).

Adding distributions to the macro disposable income contributes to the current debate by including a substantial share of income identified in the national accounts that is not included in the micro statistics. There are many differences in scope, population, or concepts between micro and macro disposable income, which also lead to different measures of inequality. Much of the work in the expert group focuses on data gaps, the difference between the macro total and the sum of micro values. These are considered as quality checks on the resulting distributions. Data gaps mainly occur because data used to compile the national accounts, and data used for distributional measures do not come from the same data source. The difficulties faced when linking micro and macro data are not new, however. In the 1980s, Ruggles and Ruggles (1986) for the USA, and Adler and Wolfson (1988) for Canada, investigated the links and (in)consistencies between micro and macro statistics. In both cases, adjustments to both the micro as well as the macro data were proposed to harmonize the statistics. In recent years the focus shifted more towards the use of micro data to arrive at a break-down of macro data by income groups, without adjusting the macro data themselves.

A second initiative that boosted the compilation of Distributional National Accounts (DINA) worldwide is the WID.world project by the World Inequality Lab (Alvaredo, *et al.*, 2016). Like the EGDNA, this group aims at a breakdown of the national accounts. There are many similarities between these projects, but the results are not directly comparable. The main difference is that the scope of the EGDNA is limited to the household sector, while the scope of the World Inequality Lab refers to the total economy. Moreover, the World Inequality Lab defines new income concepts, instead of using the SNA balancing items (Zwijnenburg, 2019).

In this article, we present our distributional national accounts for the Netherlands for 2016, following the EGDNA methodology. We follow a multi-source approach, combining a large number of different data sources. Even though many of these data sources are administrative data, we still encounter data gaps. Using a naive method to calculate the data gap, 82.1% of macro disposable income is covered by micro data. This means that for the remaining 17.9% assumptions or proxies are needed to allocate these income components to the correct households.

In 2016 the Gini coefficient for micro disposable income was 0.289 (Statistics Netherlands, 2019b). According to our calculations the Gini coefficient is 0.337 when the income concepts are made consistent with the national accounts. For users of the data it is important to understand why two similar statistics (in name) arrive at completely different levels of inequality. Therefore, we break down this difference, showing how for each step in the process the degree of inequality is adjusted. For the Netherlands the population scope, and imputations of concepts that are not in micro data prove to have a large effect. The largest differences are caused by gaps between the micro and macro aggregates. Especially the coverage of mixed income improves, which adds to the change in inequality as well. However, when placed in the comparative context of the other EGDNA countries, the increase in the Gini coefficient is not directly confirmed. The difference between micro and macro inequality is found to be very different across countries. This is important to investigate because it could be the result of the techniques used and not because of different characteristics of the economies of countries.

For the Netherlands, our results show that inequality is mainly driven by the split between labour and capital. Labour and capital shares of primary income are respectively 82% and 18% for the total of the household sector. Within the top 10%, however, the labour shares are smaller: for the top 1% the share is 56% and for the top 0.1% it is only 34%. For the latter group, capital income is the main income component, consisting mostly of dividends received. The households in the bottom of the income distribution receive capital income as well, but mainly because of their pension entitlements. A considerable fraction of primary income is redistributed through government regulated social schemes funded by taxes and social contributions. Relative to gross disposable income, contributions and taxes amount to 35%, which is evenly distributed across the deciles. However, this rate drops to 16% for the households in the top 0.1%.

This chapter is organized as follows. In Section 1.2, we present our methodology for the compilation of distributional national accounts for the Netherlands. In Section 1.3, we present our results on inequality, and the decomposition thereof. Section 1.4 places our work in the broader context of the efforts of the EGDNA. In Section 1.5, we conclude and discuss our plans for further research.

1.2. Data and Methodology

1.2.1. Population and Scope

Our target population covers all households and individuals that were present in the Netherlands in 2016, including newborns and immigrants. The inclusion of these latter groups requires explicit adjustments because micro data often focus on the population at a given reference date, such as the first day of the year. We also include non-private households, i.e. individuals living in institutions (mainly elderly living in retirement homes). The EGDNA suggests excluding the non-private households from the data, because they may behave differently from private households. We have included, however, the non-private households, so that our results are consistent with published data of the national accounts. However, these households can be identified in the data and excluded if needed in the analysis. We focus on the household as the unit of analysis, consistent with EGDNA practice. To compare income of households of different sizes, we correct for economies of scale by applying an equivalence scale[2] to the household income.

The income concepts we consider are those of the SNA sequence of accounts. Specific attention is paid to balancing items of the household sector: gross primary income, gross disposable income and adjusted gross disposable income. The difference between primary income and disposable income in SNA is made by the redistributive transactions of current taxes paid on income and wealth, social contributions paid, social benefits received in cash, and other current transfers paid and received. The latter consist of payments between households, such as alimony payments, payments to and from non-profit institutions, or payments to and from private insurance. The difference between disposable and adjusted disposable income are social transfers in-kind paid for by the government and non-profit institutions.

1.2.2. Data Sources

Distributional National Accounts are a combination of SNA macro totals and micro data containing distributional information. There is not one micro data source that covers the full SNA sequence of accounts for households. Therefore, we combine many data sources that each cover part of the macro (adjusted) disposable income of households. These data sources are a combination of administrative records, surveys, and auxiliary information.

The administrative data sources that we use all contain an anonymized social security number that allows us to match individuals across datasets. Census data give us the necessary background characteristics of individuals and allow us to link these individuals to households and vice versa. The labour accounts (LA) provide us with micro data on compensation of employees. The integral income and wealth statistics (IIWS) contain data on property income, taxes, and social schemes. The IIWS itself is already based on administrative records from the tax authorities, and the organization responsible for

[2] The OECD-modified scale, also the Oxford Modified Equivalence scale, assigns a value of 1 to the household head, of 0.5 to each additional household member aged 14 and over, and of 0.3 to each child under 14. Each individual living in an institution is considered a single person household.

implementation of the Dutch national insurance schemes (SVB). From the Registers on Addresses and Buildings (BAG) the income from owner occupied dwellings can be determined per household. Finally, the law on legal aid, and the education authority (DUO) contains individual records on the use of social transfers in kind.

Individual records are combined with surveys to cover as much of the national accounts as needed. The household budget survey (HBS) is used to estimate taxes other than those on income. Data from Money Transfer Operators (MTO) are used to estimate remittances to and from abroad. The Longitudinal Internet Studies for the Social sciences (LISS) and the Giving in the Netherlands Panel Survey (GINPS) are both used to estimate other current transfers to and from the households sector. Data of the National Institute for Public Health and the Environment is used to impute the use of long-term care.

The data sources and the methods and techniques used to combine and adapt these data are described extensively in Bruil (2018). We updated this work by including data on un-incorporated enterprises (SZO) as the preferred data source for mixed income of the self-employed. This data source is based on individual tax declarations for the self-employed. It is used by the labour accounts to estimate variables concerning self-employment, among which mixed income, interest paid and received, consumption of fixed capital, and compensation of employees paid. Furthermore, we include register data for the health insurance act (ZVW) and update income attributed to pension entitlements using the pension claims statistics (PCS).

1.2.3. Data Gaps

Even a multisource approach does not fully cover the SNA income concepts. There is still a data gap between the sum of the micro data and the SNA total, as shown by Table 1.1. A close alignment of the micro and macro data sources is important for the quality of the distributions that are incorporated in the SNA framework. Adjusted Gross Disposable Income amounted to 473.7 bn euros in 2016. This income concept amounts to 389 bn euros when relying only on the underlying micro data, i.e. 82.1% of the macro total. The remaining 17.9% then needs to be assigned through imputations and alignments (See Table 1.1).

Table 1.1: Micro-macro links (The Netherlands, 2016)

			Micro data total (bn euros)	SNA total (bn euros)	Imputation and Alignment (bn euros)
B.2g	Operating surplus	+	39.0	12.1	-26.8
B.3g	Mixed income	+	53.2	66.1	12.9
D.1	Compensation of employees	+	332.3	333.5	1.3
D.4	Property income	+	9.5	57.0	47.5
D.4	Property income	-	33.7	6.4	-27.3
B.5g	Gross Primary Income		400.1	462.4	62.2
D.5	Current taxes on income, wealth, etc.	-	64.3	56.8	-7.6
D.61	Net social contributions	-	143.7	174.7	31.0
D.62	Social benefits other than social transfers in kind	+	129.2	125.0	-4.1
D.7	Other current transfers	+	4.1	15.4	11.3
D.7	Other current transfers	-	19.3	20.5	1.3
B.6g	Gross Disposable Income		306.1	350.8	44.8
D.63	Social transfers in kind	+	83.0	122.8	39.8
B.7g	Adjusted Gross Disposable Income		389.0	473.7	84.6

Note: The table above presents the micro-macro linkage for the year 2016. The first column lists the relevant SNA 2008 codes, with their descriptions provided in the second column. Column 3 indicates whether each item contributes positively ("+") or should be subtracted ("−") when constructing the income concept. Codes beginning with B refer to *balancing items*, which are aggregate results of underlying transactions, while codes starting with D refer to *transactions in the distribution of income and use of income accounts*. The column labeled Micro Data Total shows the aggregate value derived from linked microdata sources. SNA Total presents the corresponding macroeconomic value for 2016 as recorded in the national accounts. The difference between the micro and macro figures is reported in the Imputation and Alignment column, capturing adjustments made to reconcile micro and macro sources.

Determining data gaps simply as the difference between micro and macro adjusted disposable income does not capture the effects of simultaneous positive and negative gaps, or gaps in resources and uses that cancel out. Following the recommendation by the EGDNA (OECD, 2018), the total data gap (D) can alternatively be calculated using the absolute gaps (G) at the transaction working level. The sum of all absolute gaps is divided by absolute value of resources and uses of adjusted disposable income:

$$D = \frac{(|G_{positive}| + |G_{negative}|)}{(|B.7g_{resources}| + |B.7g_{uses}|)}$$

Following this approach, the data gap would even be larger: 21.3%.[3] A data gap of 17.9% - 21.3% does not mean there is no information on distributions at all. It does mean that caution and transparency is needed in the publication of these results.

Several reasons might underlie the existence of these gaps. Often, the household sector in the National Accounts depends on the information of the other sectors in the economy or is determined by a residual approach. This is done because direct data sources covering the household sector are often not available when national accounts are constructed. An important reason for this is because these micro data are lagging in time. The omissions in the micro data are made explicit when confronting micro household data and the counterpart household sector results. The more is known about the reason of the data gap, the more specific the micro data can be aligned to the national accounts.

Another obvious reason is that certain national accounting concepts are not covered at all by micro data sources. An example is the income that is earned in the non-observed economy (as a part of mixed income in Table 1.1). Because national accounts need to be exhaustive, a macro estimate is made for the income that is earned in, for instance, trafficking and trade in illicit drugs. These profits are hidden by nature. No data sources cover these income flows and thus proxies and assumptions are used to allocate this type of income across households.

Reasons for data gaps may also be caused by the micro data, where measurement errors and non-response are known to be present in sample surveys (D'Alessio & Neri, 2015). Administrative data can be used to improve the quality of the micro-macro link, but it remains relevant how data gaps are dealt with. Auten and Splinter (2018) and Piketty, Saez and Zucman (2019) show that choices made in the allocation of the data gap influence not only the resulting distributions, but also the perspective of the development of inequality, as found by Piketty, Saez, and Zucman (2018).

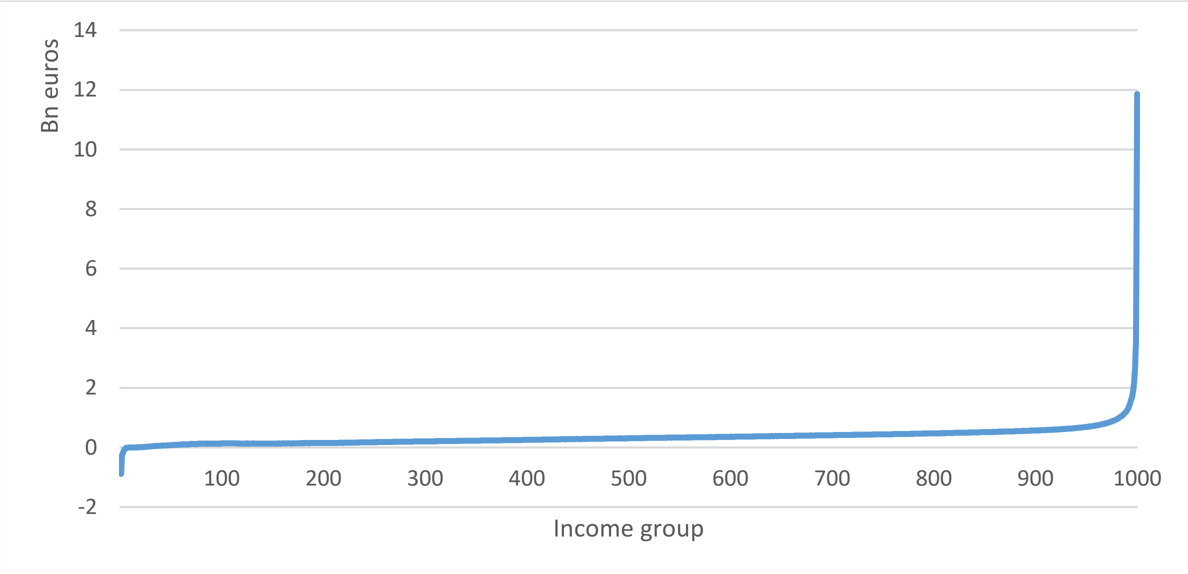
[3] This data gap is perhaps more informative, but to be exactly comparable between countries the transaction working levels should be equal. Otherwise, opposite signs might distort the comparison just as well.

1.3. The Distribution of Macro Disposable Income

1.3.1. Income Shares

We rank households according to their equivalised gross disposable income. Figure 1.1 shows the distribution of household gross disposable income in the Netherlands in 2016. This distribution is skewed and a grouping of households in quintiles (which is the level of analysis within the EGDNA) conceals considerable inequality.

Figure 1.1: Distribution of Gross Disposable Income (The Netherlands, 2016)

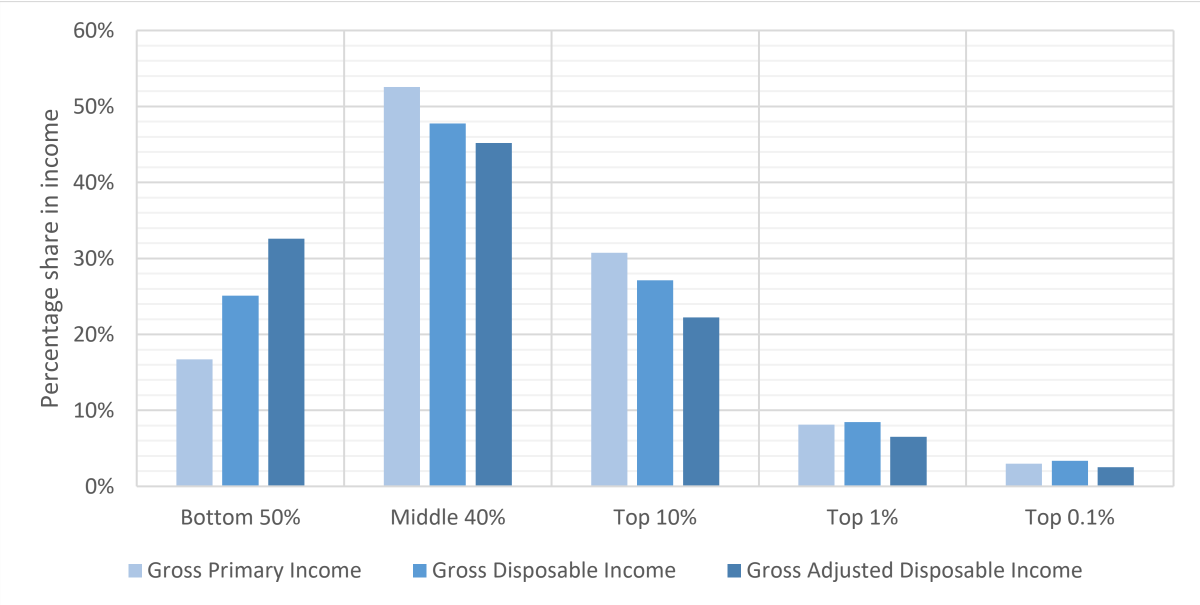


Note: The figure above displays the distribution of Gross Disposable Income (B6G) among households in 2016. Households are ranked by equivalised disposable income, which adjusts for household size and composition to account for economies of scale. The distribution is presented in promilles (per thousand groups), offering a detailed view across the entire income spectrum. The total of the distribution aligns with the macroeconomic aggregate reported in Table 1, amounting to €350.8 billion.

Total gross disposable income amounted to 350.8 bn euros, of which 11.9 bn euros went to the top 0.1%. At the bottom of the income distribution, incomes are negative. This may be the case for operating surplus in the household sector, which refers to income derived from owner occupied dwellings; this value is negative when the imputed rent is smaller than the cost of maintaining those dwellings. Also, mixed income of the self-employed person may be negative when their income is lower than the cost of operating their business. Disposable income might be negative as well when taxes and social contributions are higher than income. This might happen for instance when taxes from previous years are paid in full in the reference year. Negative net property income may further add to negative disposable income, when property income received is less than property income paid. Finally, it is also possible that these negative incomes are the results of noise in the data.

Gross primary income amounted to 462.4 bn euros in 2016. After the governmental and private redistribution schemes, gross adjusted disposable income was 473.7 bn euros. Excluding transfers-in-kind, gross disposable income amounted to 350.8 bn euros. In Figure 1.2 the share of each income group in total income is presented. The bottom 50% of the income distribution earned 17% of primary income, which equals 19 thousand euro per household on average. Their income doubles to 38 thousand euros, after receiving benefits in cash and in kind and after paying their contributions to the social security system. Their share in adjusted disposable income thus grows to 33%.

Figure 1.2: Share in total income by income concept and income group (The Netherlands, 2016)



Note: This figure shows the share in total household income by income concept and income group in the Netherlands, 2016. Three income concepts are presented: Gross Primary Income includes income from labour, self-employment, and property before any redistribution via taxes or social transfers, Gross Disposable Income reflects the income available to households after taxes and social contributions have been deducted and social benefits in cash received. Gross Adjusted Disposable Income adds in-kind social transfers (e.g. education, healthcare) to gross disposable income, providing a broader measure of material well-being. Households are ranked by their equivalised gross disposable income, meaning that their position in the income distribution—and thus their grouping—does not change when a different income concept is considered.

While the bottom 50% of the income distribution are net receivers of redistributive transfers, the other income groups that we identified are net contributors. The income share of the middle 40% drops from 53% in primary income to 45% in adjusted disposable income, and for the top 10% it drops from 31% to 22%. The distribution of gross adjusted disposable income is far more equal than the distribution of primary income: the average income of the top 0.1% is 39 rather than 90 times the average income of the bottom 50%.

Statistics Netherlands publishes real income growth for the household sector including non-profit institutions serving households (NPISH), using the net disposable income concept.[4] For 2016, real disposable income grew by 2.4%. Excluding the NPISH, net disposable income growth of solely the household sector was 2.5%. Growth per capita was lower: 1.9% for net disposable income. This average growth rate does not apply to all income groups. Growth of the bottom 50% and the top 10% were close to the average, 2.0% and 2.1% respectively. The middle 40% lagged somewhat behind with a per capita real growth of net disposable income of 1.5%. It is remarkable that the growth rates of the top 1% and the top 0.1% are much larger, with rates of 10.7% for the top 1% of the population and exceeding 38% for the top 0.1%.

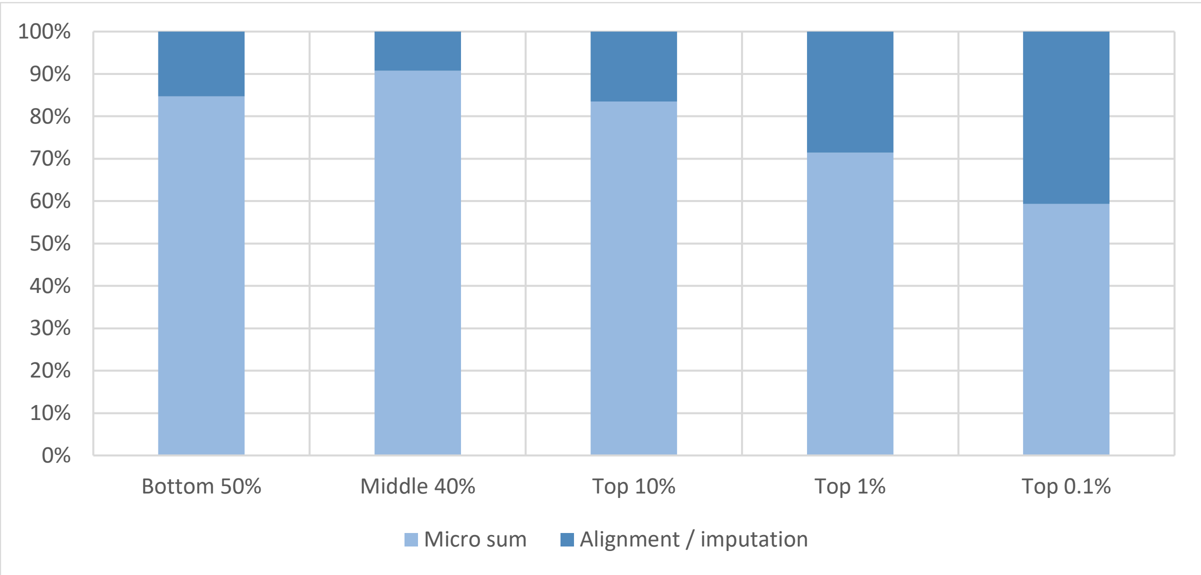
These growth rates are not only the result of underlying micro data, but also of the choices made in imputation and alignment of the data gaps. The data gap for gross adjusted disposable income of the total household sector was 17.9%, but the comparison by income group shows that the impact is larger for the higher income groups (see Figure 1.3). For the top 10% the data gap was 18.8%. For and within the top 1%, this coverage was even much smaller. For the top 0.1% only 59.4% was covered by micro data and the data gap was thus 40.6%. The data gap for the top 0.1% can be largely explained by missing dividends in the micro data. We allocated this data gap proportionally to the observed dividend flows. The

[4] We also have a distribution of consumption of fixed capital. This allows us considering net concepts of the balancing items as well. The estimates of real growth have been using for all household groups. Current data availability does not allow us calculating more precise deflators. We do acknowledge however, that final consumption patterns differ between the identified income groups.

distribution of observed dividends is very skewed and the allocation of the data gap therefore mainly affected the disposable income of the already rich households.

The Gini coefficient equals 0.337. This is substantially higher than the number found in the micro data (0.289). Apart from the addition of other data sources and the adjustments we make to the IIWS (which is the data source that the micro Gini is derived from), the differences in population also adds to the increase in observed inequality. Because we want to cover the entire population, we also include households that live in the Netherlands for only a short time. Those households have relatively low incomes as compared to households that live here for the entire year. Moreover, the IIWS excludes households in non-private dwellings from their publication. Furthermore, the equivalence scale used to standardize results differs between both statistics.

Figure 1.3: Data gap for disposable income per income group (The Netherlands, 2016)



Note: The figure displays the data gap for disposable income by income group in the Netherlands, 2016. Households are ranked by equivalised disposable income, taking household size and composition into account. For each income group, the figure shows the share of disposable income directly observed in microdata sources, alongside the share that relies on adjustments, imputations, or alignment procedures to ensure consistency with macroeconomic totals. This illustrates how data completeness varies across the income distribution.

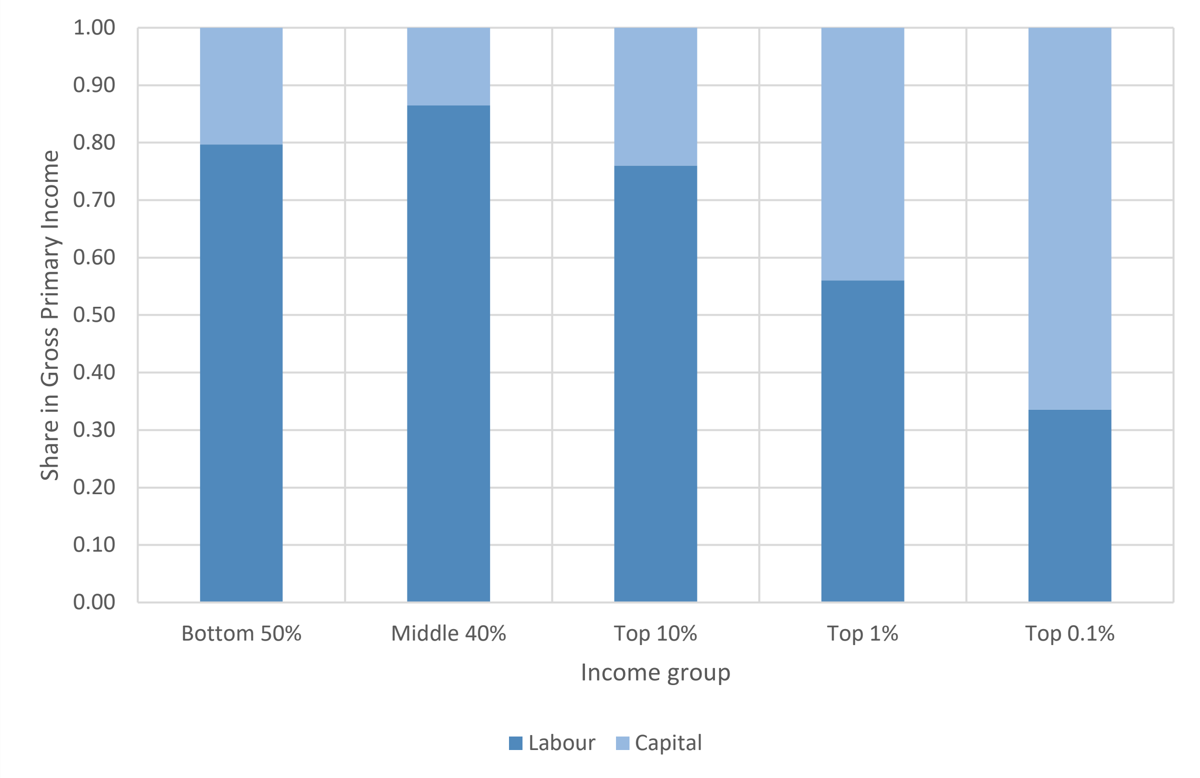
1.3.2. Decomposition of Household Income

Labour and Capital

Labour and capital income are the two components of primary income. Mixed income of self-employed is a special case because it consists of both elements. However, it is debatable to what extent the income of self-employed is a return on either of the two components (Kravis, 1959). In the sequence of accounts, the SNA does not attempt to make this split. Additional indicators such as the labour share of income do need to allocate mixed income either to labour or capital. Statistics Netherlands allocates the entire mixed income to labour in the compilation of the labour share (CPB, DNB, CBS, 2017). In this study, we allocate a fixed share of mixed income to capital (30%) and to labour (70%). These shares are comparable to Kravis' option to allocate one-third of mixed income to capital and two-thirds to labour. However, both choices remain arbitrary because there is no underlying economic measure included. For the total household sector in the Netherlands, the resulting labour and capital shares of primary income are respectively 82% and 18% in 2016.

We find that the decomposition of primary income is very different for the income groups that we identified (see Figure 1.4). This does not show up well when income deciles or higher aggregates are analyzed. The households in the bottom half of the income distribution receive 80% of their primary income from labour and for the households in the top 10% this is 76%. However, within the top 10% the shares deviate considerably from the national accounts average. The top 1% of the household income distribution receives only 56% of their primary income from labour. The main component for the top 0.1% is by far capital income (66%). These findings for the Netherlands are consistent with the extensive work by Piketty (2014) that started the current debate on inequality.

Figure 1.4: Share of labour and capital in total Gross Primary Income (The Netherlands, 2016)



Note: This figure presents the share of labour and capital income in total Gross Primary Income by income group in the Netherlands, 2016. Gross Primary Income is decomposed into Labour income, defined as compensation of employees plus 70% of self-employment income, and Capital income, comprising 30% of self-employment income, operating surplus, and property income. Households are ranked by equivalised disposable income, which adjusts for household size and composition. The figure illustrates how the composition of income varies across the income distribution.

Figure 1.5 shows a further breakdown of capital income into the various underlying components, i.e. (part of) mixed income, dividends, other investment income (attributable to insurance policy holders, payable on pension entitlements, and attributable to collective investment fund shareholders), and other property income. The latter includes net interest received and operating surplus. The importance of each of these components differs mainly between the top 10% and the remaining 90% of the population.

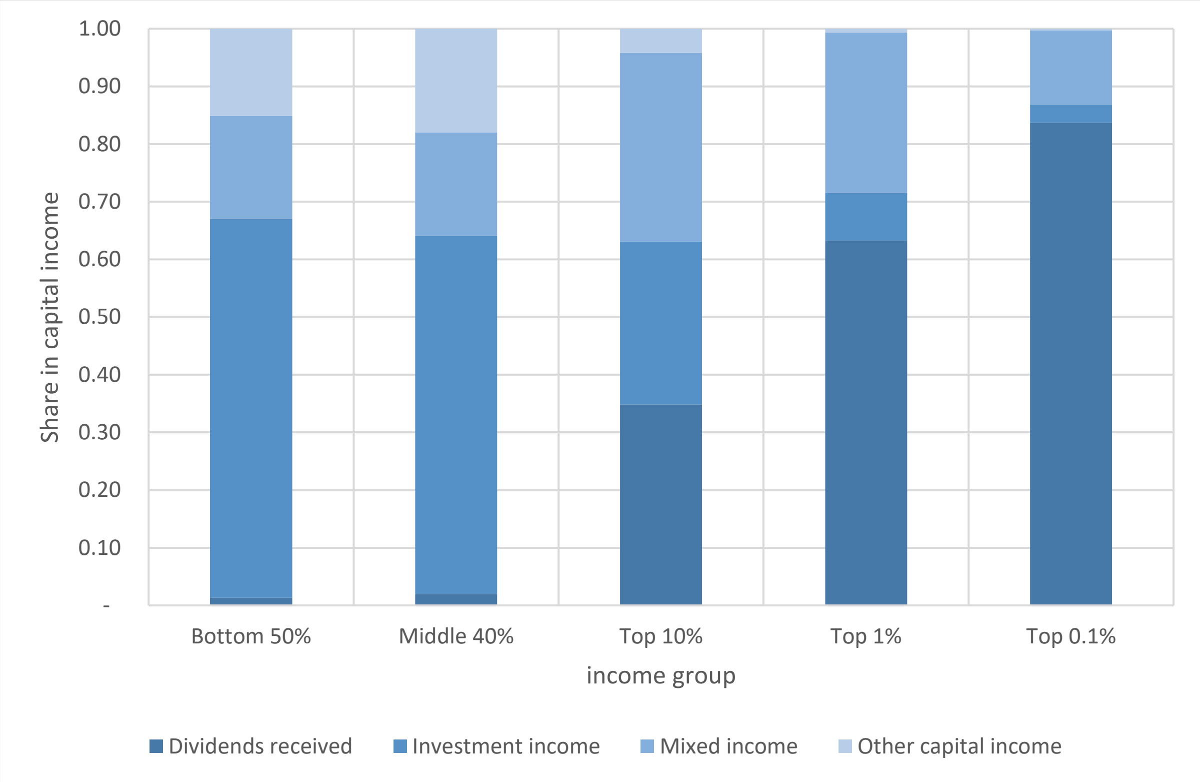
For the bottom 50% and the middle 40%, capital income mainly comes from investment income. This reflects the return on investment made by pension funds. In the Netherlands, the pension entitlements that households hold amount to 1,454 billion euros (205 percent of Gross Domestic Product) in 2016. These entitlements are held largely in funded schemes which yield a sizeable return. Property income received by the pension funds is rerouted to households in the form of investment income. However, households do not see these income flows from investments in their bank account, as this income flow is also recorded as supplementary pension contributions, thus as a part of the redistribution accounts. As a result, for the bottom 50% and middle 40% of the income distribution, this instrument is the most important component of their capital income but does not add to their disposable income.

On the opposite side of the income distribution, we find that dividends make up 35% of property income of the top 10%. For the top 0.1% this share is even 63%. On average, a household in the top 0.1% receives 950 thousand euros in dividends. For a household in the bottom half of the distribution this is 53 euros. These income transactions mainly come from owner-directors who pay out these dividends to themselves.

In 2016, only 50% of the total dividends in the national accounts was covered by the micro data. In the micro data, these dividends do not necessarily relate to income earned in that year but are possibly the effect of temporarily reduced tax rates. In 2014 and 2007 tax rates were relatively low, and the observed dividends in the micro data were much higher.[5] The amount that results in national accounts originates in the non-financial sector, where higher dividends are paid out than said to be received by the households. Moreover, the level is more constant over time, and more in line with the SNA.

[5] See https://opendata.cbs.nl/statline/#/CBS/nl/dataset/84493NED/table?dl=652D5 for the most recent time series, and https://opendata.cbs.nl/statline/#/CBS/nl/dataset/70991ned/table?dl=306DF for the preceding series, including 2007.

Figure 1.5: Share of capital income components in total capital income (The Netherlands, 2016)

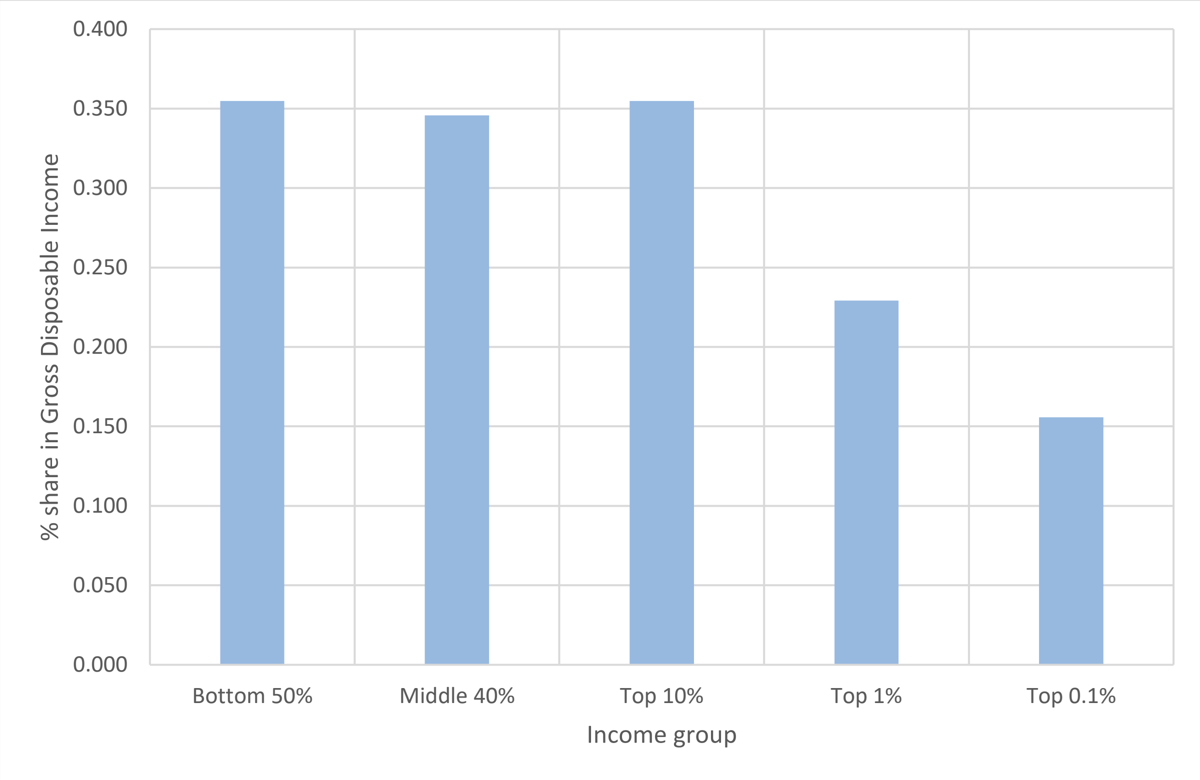


Note: The figure shows the share of capital income components in total capital income for the Netherlands in 2016. Capital income is broken down into four components: Dividends received, Investment income (primarily consisting of returns on pension entitlements), Mixed income (representing the capital component of self-employment income), and Other capital income(which includes operating surplus, interest, and rental income). This decomposition highlights the relative contribution of different sources to total capital income across the household sector.

Redistribution

In the Netherlands, redistribution is for the largest part organized through social schemes of the government, which execute unemployment and disability insurance schemes as well as the public pension system. Furthermore, a mandatory collective pension scheme exists, carrying out work-related pension schemes as a tool for life-cycle savings. Employers and employees finance these schemes through taxes and social contributions. Households pay their national insurance contributions together with their income and wage tax. Relative to gross disposable income contributions are evenly distributed over the deciles, with an effective tax rate of around 35%. Here we find a distinct difference for the top 1%, and top 0.1%. For these groups, the effective tax rates drop to 23% and 16%, respectively. At this point, it is important to understand the effect of the data gaps. Because we allocated the data gap for dividends proportionally, this ended up at the top of the income distribution, further increasing their disposable income. This is a necessary adjustment, which in our view is the best one possible. However, without this adjustment disposable income would be lower and the effective tax rates presented in Figure 1.6 would be higher. We would still see a declining effective rate, but not to the current extent.

Figure 1.6: Taxes and social contributions as a percentage of Gross Disposable Income (The Netherlands, 2016)

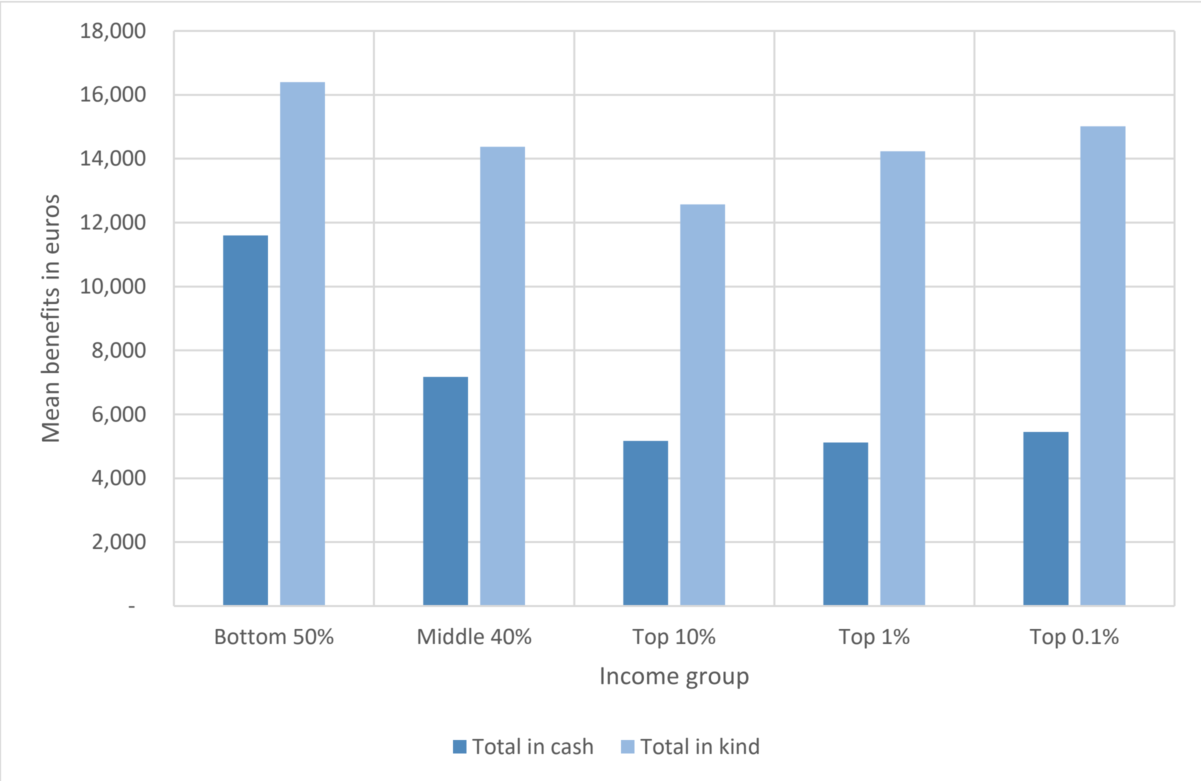


Note: This figure displays taxes and social contributions as a percentage of Gross Disposable Income by income group in the Netherlands, 2016. It includes taxes on income and wealth as well as social contributions paid by households. The percentage is calculated relative to each group's gross disposable income. Households are ranked by equivalised disposable income, accounting for differences in household size and composition. This figure illustrates how the relative tax burden varies across the income distribution.

On the other side of the redistribution schemes are the benefits. National accounting distinguishes benefits in cash, and in-kind. The latter includes goods and services, which are provided to households by the government sector or NPISH, either free or at insignificant prices. The largest part of these goods and services includes educational, healthcare, and social security services. In addition, welfare, sports and recreation, culture, and provision of housing are offered in-kind, including many minor schemes targeting specific subgroups of the population. The in-kind benefits amount to 26% of adjusted disposable income.

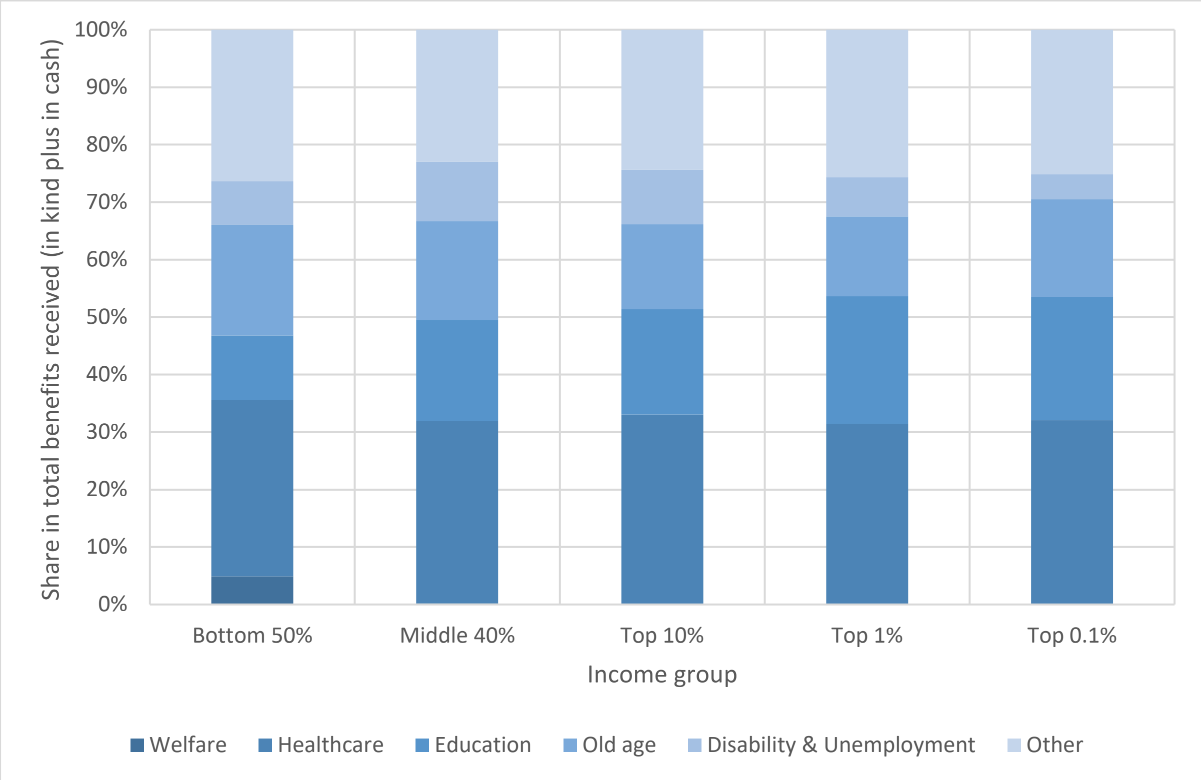
Most of the above transactions depend on the age distribution within the population, which is used in the compilation of the distributions of some schemes (Bruil, 2018). For instance, the young mainly consume education. As a result, the distribution between income groups depends on the number of young people per income group. There are schemes that depend on the level of income - housing services is one of them - and these are covered by micro data. On average households in the bottom 50% receive 16.4 thousand euro of in-kind transfers, while for the top 10% this is 12.6 thousand euros. Within the top 1%, the average benefit increases again, because of relatively higher healthcare costs. Benefits in cash more frequently depend on income. This is reflected in the average benefit per income group. The bottom 50% receives on average 11.6 thousand euros, more than double the amount received in the top of the distribution (See Figure 1.7). Only welfare benefits have a different distribution because these are targeted to the lower income households. Only the bottom 50% benefits from these schemes (See Figure 1.8).

Figure 1.7: Mean social benefits in kind and in cash by income group (The Netherlands, 2016)



Note: The figure above presents the mean social benefits received in kind and in cash by income group in the Netherlands, 2016. It shows, for each group, the average value of the social benefits in cash and in kind. Households are ranked by equivalised disposable income, adjusting for household size and composition.

Figure 1.8: Total benefits by purpose (The Netherlands, 2016)

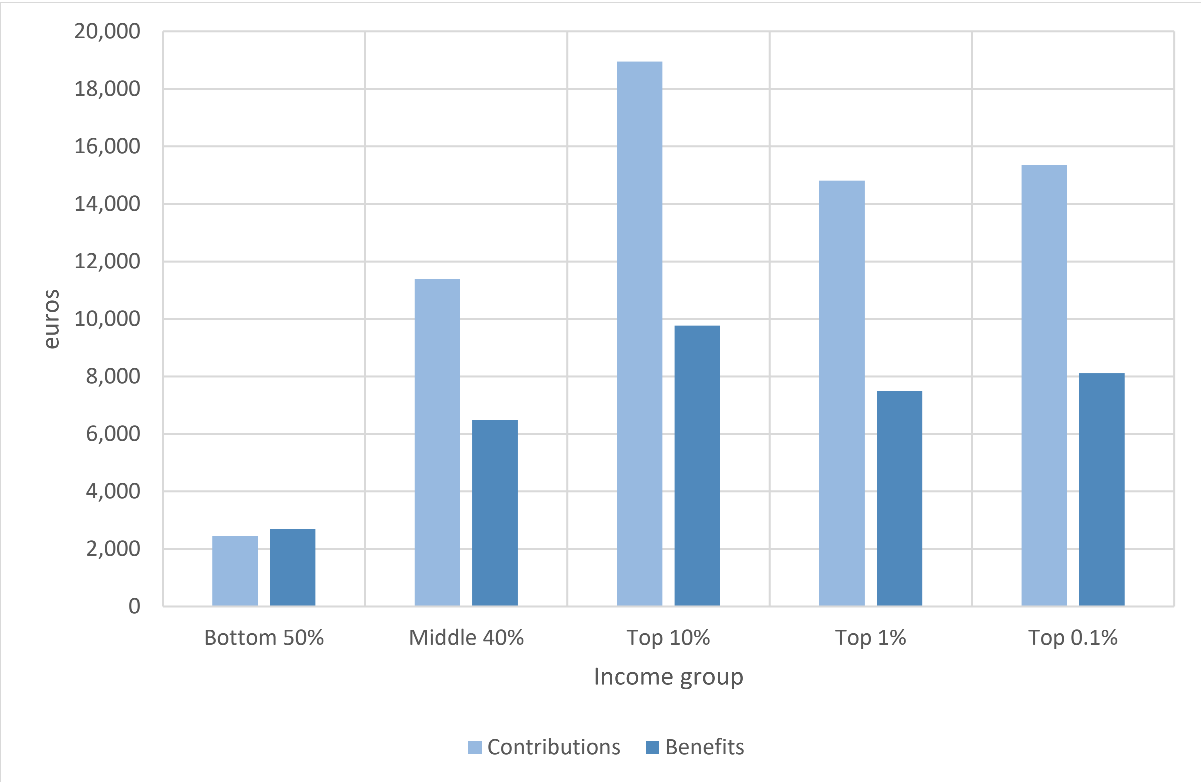


Note: The figure shows the share of social benefits by purpose in total benefits received (in cash and in kind) across income groups in the Netherlands, 2016. Households are ranked by equivalised disposable income, accounting for differences in household size and composition. For each income group, the figure presents the relative contribution of different types of schemes to the total benefits received, including: Welfare, Healthcare, Education, Old age, Disability and Unemployment, and Other schemes, which includes miscellaneous support schemes, such as income support for the elderly, sickness schemes, and supplementary allowances. This figure highlights how the composition of public support varies by income level and type of benefit.

The work-related pension scheme is the second largest component of redistribution in the national accounts of the Netherlands. Both employers and employees contribute to the pension entitlements, which further increase through return on these assets. We have seen that investment income is the largest income component of property income for the bottom 50%. These flows are also recorded as supplementary pension contributions. In the Netherlands, the sum of the contributions greatly exceeds the paid out benefits to retirees. These net contributions (pension contributions minus benefits) are considered as compulsory savings and amount to 6.3% of gross disposable income in 2016. This is the largest component of total household savings, larger than individual savings that result after consumption is deducted from disposable income.

Even though contributions are larger than benefits for the economy as a whole, the opposite is true for the bottom 50%. The retirees in this group receive a higher amount than is contributed by the employees in the working ages (See Figure 1.9). As a result, compulsory savings in this group are negative. Total savings are negative for the two bottom quintiles, which also shows up in the EGDNA results for other countries (Office for National Statistics, 2015; Australian Bureau of Statistics, 2018; Stats NZ, 2018; Statistics Canada, 2019). The average contribution increases with the income and therefore affects the income distribution between income groups. Because the work-related pension scheme depends on labour income, and not capital income, these averages are lower in the top 1% and top 0.1%, compared to the top 10%.

Figure 1.9: Mean pension contributions and benefits by income group (The Netherlands, 2016)



Note: The figure above displays the mean pension contributions and pension benefits by income group in the Netherlands, 2016. Households are ranked by equivalised disposable income, accounting for household size and composition. For each income group, the figure shows: the mean pension contributions, including those paid directly by households, by employers on their behalf, and through returns on pension fund investments, and the occupational pension benefits received. A situation where benefits exceed contributions indicates net dissaving from pension entitlements for that group in 2016, while the reverse reflects net saving into the pension system.

1.4. International Comparison

The results of the EGDNA are published by the Organisation for Economic Co-operation and Development (OECD) as experimental statistics[6], and described by Zwijnenburg *et al.* (2021). The OECD database also includes data derived from the so-called 'centralized approach'. This approach is undertaken by the secretariat of the expert group, and provides results for all countries, using a harmonized micro data source (EU-SILC), and a common methodology. However, national results are preferred because they include the knowledge of national experts as well as more and perhaps better data sources. Furthermore, the centralized approach does not cover the social transfers in kind, which means that a comparison of adjusted disposable income cannot be made. We exclude the centralized approach from the analysis that follows for these reasons. Inequality as found in the micro data is also published by the OECD, in the income distribution database.[7]

The confrontation of these two datasets shows the effect of bringing distributional measures into the national accounts.[8] A cross-country comparison shows that both direction and size of the difference between Gini coefficients based on micro-data versus Gini coefficients based on distributional national accounts varies. For example, for the UK, Italy, Australia, and Ireland, inequality is substantially lower when it is considered within the SNA framework. For Sweden, the Czech Republic, and the Netherlands, inequality is much higher than found in the micro data (See Table 1.2).

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[6] https://stats.oecd.org/Index.aspx?DataSetCode=EGDNA_PUBLIC

[7] https://stats.oecd.org/Index.aspx?DataSetCode=IDD

[8] The micro data underlying the IDD are not necessarily used by countries to construct their EGDNA results. Just as we did for the Netherlands, different data sources may be used instead and thus add to the observed differences.

Table 1.2: Comparison of Gini coefficients in micro and macro data

Database	GBR 2015	ITA 2015	AUS 2015*	IRL 2015	FRA 2015	MEX 2016	SVN 2015	USA 2015	NZL 2012	CAN 2015	NLD 2015	SWE 2015	CZE 2017
EGDNA	0.271	0.283	0.297	0.265	0.283	0.452	0.246	0.387	0.336	0.325	0.334	0.327	0.325
IDD	0.360	0.333	0.330	0.298	0.295	0.458	0.250	0.390	0.333	0.318	0.288	0.278	0.249
Difference	-0.089	-0.050	-0.033	-0.033	-0.012	-0.006	-0.004	-0.003	0.003	0.007	0.046	0.049	0.076

Note: The table above presents a comparison of Gini coefficients based on microdata and macro-adjusted data sources. The IDD (Income Distribution Database) values are taken from the OECD website, representing inequality as measured in standard household surveys. The Gini coefficients from the Expert Group on Disparities in a National Accounts framework (EGDNA) are calculated by the author, based on quintile groupings in the experimental data also published by the OECD. For Australia, the comparison is made between EGDNA data for 2015 and IDD data for 2016, reflecting the closest available years for alignment.

The reasons for these differences are not straightforward. Every step that is taken to construct the EGDNA results, affects inequality in its own way. For the Netherlands we can break these steps down in order to see the magnitude of these effects on the Gini coefficient (see Table 1.3) in 2016. The Gini we find in the micro data does not correspond exactly to the published results, because the latter are normalized to better include negative values, following Raffinetti *et al.* (2015).[9] Furthermore, the published inequality measure is based upon a country specific equivalence scale, where the EGDNA proposes the use of a common scale, the OECD-modified scale.

An important factor when linking micro and macro data is the population scope. The micro data covers only private households and excludes institutionalized households. When we expand the population to all households in the Netherlands, including the elderly in nursing homes as well as student households, inequality rises (0.019).[10] The logic behind this is that these households have low incomes, often only a small pension or in case of students a small allowance, either from the government or from parents. By adding these households to the bottom of the distribution we increase inequality. The EGDNA proposes to exclude households in institutions. Sweden, which has a comparable change in inequality as the Netherlands, followed these recommendations, while the Netherlands did not. The rise in inequality in Sweden must therefore have a different origin. On the other hand, Mexico and

[9] Moreover, the published value is based on a later version of the micro data than used in these studies.

[10] In the Netherlands, the majority of institutionalized households are elderly living in retirement homes. We include them in our data and treat each person as a single person household.

New-Zealand adjust their national accounts totals to exclude these households, but the increase in inequality that the Netherlands observes is not seen in these countries.

Bruil (2018) shows that there are many differences between micro and macro disposable income. Not all income components in micro disposable income are part of macro disposable income. For the Netherlands rental subsidies are excluded from the micro data; however, they are treated as part of social transfers in kind in the national accounts. These subsidies relate strongly to income. Together with excluding smaller transactions the Gini rises by 0.013. Rental subsidies are relatively high in the Netherlands, so it would be reasonable to think that this is one of the explanations why inequality in the Netherlands rises more than in other countries.

However, the biggest change in inequality occurs when comparable micro and macro income transactions are not taken from the IIWS, which is used for the inequality statistics published by the OECD[11], but from other micro data sources (0.031). This is true for compensation of employees (0.010), mixed income of the self-employed (0.018), and operating surplus (0.003). The preferred data sources do not only align better with national accounts concepts, but also levels. Especially the mixed income of the self-employed has a large data gap when compared with the IIWS, which is partly due to a net recording (after consumption of fixed capital) in the micro data versus a gross recording in the national accounts.

[11] https://www.oecd.org/els/soc/IDD-Metadata.pdf

Table 1.3: Breakdown of the change in Gini coefficient between micro and macro data (The Netherlands, 2016)

Gini coefficient in micro data (private households only)	0.284
… change equivalence scale	-0.007
… include total population	0.019
… exclude micro income transactions that are not part of macro income	0.013
… replace transactions taken from different data sources	0.031
… include NA concepts that are not part of micro income	-0.016
… balance items to NA levels and scope	0.012
Gini coefficient in macro data	0.337

Note: This table shows a breakdown of the change in the Gini coefficient between microdata and macro-adjusted data for the Netherlands in 2016. The first row presents the Gini coefficient based on unadjusted microdata, while the last row shows the final estimate after aligning with macroeconomic totals. The intermediate rows represent successive steps in the adjustment process, illustrating how each stage affects the measured level of income inequality.

There is a remaining data gap in mixed income, as can be seen in Zwijnenburg (2021, p.22), who juxtaposes coverage rates by country and income components. For the Netherlands this is largely the result of the income earned in the non-observed economy, which ends up entirely in the data gap. Including national accounting concepts that are not part of the micro data has the largest levelling effect in our breakdown (-0.016), of which -0.009 is the result of allocating the non-observed economy. The EGDNA results do not distinguish between these two elements of mixed income, which is necessary to interpret the results adequately. The EGDNA coverage rates for mixed income are relatively poor. If the data gap relates to the self-employed, balancing to national accounts totals will have a very different effect on inequality than if the gap originates from the non-observed economy.

Another levelling effect is due to the large pension system in the Netherlands. Included in the social contributions are the service charges paid to operate the system. The effect on inequality is like that of the non-observed economy (-0.008). These costs are allocated evenly across participants. In the Netherlands in 2016 these service charge costs are about 2.5 percent of disposable income, but much lower in other countries. In Ireland these are 1.1 percent of disposable income, and in Sweden 0.7 percent. In Slovenia, the Czech Republic, France, and Italy it is between 0.0 and 0.2 percent.[12] In the countries where this transaction is relatively small, the effect of imputation on inequality will be small as well. To

[12] Calculated on Eurostat data from table NASA_10_NF_TR.

a lesser extent, the same is true for income attributable to insurance policy holders. In the Netherlands this income component amounts to 1.5 percent of disposable income and the imputation leads to a lower Gini coefficient by 0.004 points. The share in disposable income is only higher in France and Italy. These countries likely have a larger leveling effect from this item.

In the final step, items are reconciled with the scope and totals of the national accounts. This includes the addition of private households that were not present in the Netherlands on the first of January. They are excluded from the micro data but are part of the national accounts' totals. Balancing is often done proportionally to the known distribution, and so the effect on inequality depends on the relative sizes of all gaps. In the EGDNA results, especially Mexico and the USA have large data gaps, and the choices made to allocate them are important to understand how inequality changes because of these corrections to the micro data. Inequality in both countries does not change much, while data gaps are far lower in the Netherlands where inequality rises.

The EGDNA focuses on the ratio of the richest 20% of the households versus the poorest 20% as a measure of inequality. These ratios are, just as the Gini coefficients, far apart for the participating countries (see Table 1.4).

Table 1.4: Ratio of highest income quintile to the lowest

	ITA 2015	SVN 2015	FRA 2015	NZL 2015	GBR 2015	USA 2015	CZE 2017	AUS 2015	SWE 2015	MEX 2016	NLD 2015	CAN 2015
Gross Primary Income	5.2	5.3	8.9	9.1	9.9	11.1	11.6	12.3	14.0	16.2	16.7	18.2
Gross Disposable Income	5.1	3.9	4.6	6.5	4.2	8.2	5.8	5.3	7.3	10.3	7.3	6.9
Gross Adjusted Disposable Income		3.1	3.1	4.0	2.7	7.0	3.8	3.3	3.5	7.6	3.5	4.2

Note: Table 1.4 presents the ratio of average income in the highest income quintile to that in the lowest quintile, based on data from the OECD EGDNA database. The computation is carried out by the author, using per household income values. The table compares this ratio across the three income concepts examined throughout the paper: gross primary income, gross disposable income, and gross adjusted disposable income. For Italy, results for adjusted disposable income are not available due to the lack of data on social transfers in kind.

Inequality is large in the Netherlands when primary income is considered. The ratio is also partly affected by our population scope. When adjusted for the difference in population, the ratio for Dutch households falls to 14.3 for primary income to 6.3 for disposable income, and 3.3 for adjusted disposable income. Even after excluding institutional households, inequality in primary income remains high compared to the other countries in Table 1.4. We focus on the per household income values here, but the same findings can be derived by the income values per consumption unit, as presented by Zwijnenburg (2021).

In all countries the main income component of primary income is compensation of employees. The distribution of this item largely determines the resulting ratios of primary income. For the Netherlands, the distribution of compensation of employees is comparable with the distributions in Australia, and Canada. In those countries the primary income ratio is high as well. There is a large difference between these countries and France, New-Zealand, Slovenia, Italy and the USA, where inequality of compensation of employees is about half to one-third of the ratio found in the former countries. Secondly, the self-employment rate in the Netherlands is relatively high compared to the other countries, which makes mixed income an important income component for Dutch households. The distribution of mixed income is skewed and, because levels are high, this impacts on the level of inequality of primary income as well. Finally, the income from owner occupied dwellings is relatively low in the Netherlands. Not only is the share of homeowners in the Netherlands among the lowest of these countries, but these dwellings are financed through large mortgage debts. The financial intermediation services related to the interest paid on this debt is recorded as intermediate use, hence lowering the operating surplus. In the resulting distributions operating surplus for the bottom 20% is even negative in the Netherlands in 2016, meaning that the costs exceed the production of dwelling services. The distribution of this item is skewed, but the contribution to primary income is low. In all other countries, except for Sweden, the relative contribution of operating surplus to primary income is much larger. On the other hand, we saw that property income is an important component of primary income for Dutch households at the bottom of the income distribution. Whereas in the other countries property income is mostly related to distributed earnings from corporations, in the Netherlands investment income payable on pension entitlements is more important. This income component relates to the Dutch pension funds whose assets are among the highest worldwide and have a relatively even distribution across households.

The levels of inequality are lower through redistribution of income in all EGDNA countries. The effect is largest in the Netherlands and Canada, for a large part due to the transfers in-kind. These amount to 26.4% of adjusted disposable income in the Netherlands, and 21.1% in Canada. This share is only higher in Sweden: 29.2%.

1.5. Conclusion and Further Research

We created distributional national accounts for the Netherlands, reconciling many (administrative) micro data sources with the national accounts totals of 2016. The use of these individual data sources allowed us to work at a detailed level. Most inequality measures are based on micro concepts of household income, which fail to capture a substantial share of income identified in the national accounts. By explicitly incorporating micro data in macro concepts and levels, we arrive at distributional measures consistent with national accounts totals. We find that income inequality in the Netherlands is higher than previously found.

Our results show that the composition of primary income is very different across the income distribution. The top of the income distribution relies mostly on capital income and on dividends in particular. Households that are in the bottom 90% of the income distribution mainly depend on labour income. The property income they receive is largely imputed and consists of investment income on their pension entitlements. They do not actually receive these flows but contribute these to the pension funds again. Primary income is redistributed through taxes and social contributions and (in-kind) benefits. As a result, inequality in (adjusted) disposable income is much lower than it is in primary income. We find that effective tax rates, as measured by the taxes and social contributions as a percentage of gross disposable income are around 35% for all deciles. However, within the top 10% these rates fall considerably.

The effect of making inequality statistics consistent with the national accounts differs across countries. In principle, the difference between micro and macro inequality can arise through several different mechanisms. In addition to a difference in the population scope and conceptual differences between micro and macro variables, the most important factor is the treatment of data gaps. In this paper, we have stressed the importance of transparency and clarity regarding the assumptions used in this process. Even though we used many data sources of good quality, we still have a data gap of 17.9% - 21.3%.

The EGDNA results give an interesting first insight in the differences between countries. Differences between the levels of inequality in the participating EGDNA countries and the Netherlands can be partially explained by characteristics of the Dutch household sector, where relatively few households own their own dwelling and relatively many receive income from self-employment. We find that the high mortgage debt and the entitlements Dutch households hold in pension funds affect inequality measures through the related income flows. The results for the Netherlands show a resemblance with those for Sweden. When focusing on the EGDNA results, both countries have a relatively high inequality in primary income and are among the countries with the largest redistribution. For both countries, inequality as measured in the EGDNA is much higher than it is in the micro statistics. However, to gain a better understanding of inequality and have a more comprehensive comparison of levels and changes between countries, more granularity is needed in the presentation of income transactions as well as in the breakdown of the population.

We feel that this research adds important insights in the income distribution within the Netherlands. Statistics Netherlands compiles and publishes these distributional national accounts annually, from the research year 2015 onwards. This publication includes not only the income components presented here, but also final consumption, savings, and balance sheets of households. We intend to further improve upon the current results in the future. Much of the research will focus on the need to further close the data gaps. We will do this by assessing the usefulness of new data sources that cover current blank spots. It is necessary to gather a better understanding why data gaps occur, especially those that influence inequality the most, as we have seen with dividends. More future research focuses on the wealth components and the effect of pension entitlements on wealth inequality. We created a rich data set that can be used to analyse household distributions in several ways and we are actively working together with researchers outside Statistics Netherlands. For instance, with the CPB Bureau of Economic Policy Analysis we will extend the scope to the total economy, in line with the work done by the World Inequality Lab and analyze the effective tax rate by including VAT, inheritance tax, and corporate taxes.

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Chapter 2

2. Understanding Economic Inequality: The Joint Role of Pension Entitlements, Income, and Wealth

2.1. Introduction

Although inequality research has traditionally centered on income, the wealth dimension has reemerged as a focal point over the past decade, driven by Piketty's (2014) influential work. The significance of wealth lies in its capacity to confer economic power and enable social and political influence (Van Bavel, 2014; Saez & Zucman, 2019), yet it had long remained a neglected aspect in discussions of inequality. Moreover, existing studies of wealth inequality do not capture the entirety of household assets, typically excluding pension entitlements (Van Bavel & Salverda, 2014; OECD, 2015). This omission understates the resources of middle-income households and overstates wealth concentration at the top (Van Bavel & Frankema, 2017).

This study investigates how the inclusion of pension entitlements affects measured wealth inequality in the Netherlands. While pension entitlements are often not covered by household surveys and micro statistics, they are included in the macroeconomic framework of the System of National Accounts. Closing the conceptual and statistical gap is a central aim of international initiatives such as the International Monetary Fund's Data Gaps Initiative, and international expert groups by the OECD and the ECB who advocate integrating distributional indicators into the System of National Accounts (FSB, 2009; ECB, 2024).

In this study we construct distributional wealth accounts for the Netherlands that are consistent with the System of National Accounts (SNA) framework, focusing on the net worth of the household sector, defined as financial and non-financial assets minus liabilities. Using a comprehensive linked household database (Bruil, 2023), we integrate microdata from several sources, including the Integral Income and Wealth Studies (IIWS), Pension Claims Statistics (PCS), the Household Finance and Consumption Survey (HFCS), and property valuation data. Discrepancies between micro- and macro-level data are systematically reconciled by imputing missing components and reallocating unmatched aggregates across individuals and households, thereby ensuring alignment with SNA totals.

Building on this framework, we analyze pension wealth in two steps. First, we incorporate accrued-to-date occupational pension entitlements, discounted using the Interest Rate

Term Structure (IRTS) prescribed by Dutch regulatory standards. Second, we extend the definition of net worth by adding public pension entitlements, estimated according to the methodology outlined in the Eurostat supplementary pension table guidelines (Eurostat, European Central Bank, 2011), but adapted to maintain consistency with occupational pension valuation. We employ the accrued benefit obligation (ABO) approach and a closed-group assumption to ensure comparability with SNA principles. This extended wealth concept allows us to assess how the inclusion of pension entitlements affects wealth inequality metrics.

Beyond analyzing wealth distributions in isolation, this study also explores the joint distribution of income, wealth, and savings to provide a more nuanced understanding of economic inequality. By linking these dimensions, the research aims to shed light on an apparent paradox: the Netherlands is characterized by relatively high levels of wealth inequality alongside comparatively low levels of income inequality. Understanding the role of pension entitlements and the interplay between income, wealth, and savings distributions is crucial to forming a more complete picture of economic well-being across the population.

We find that while private pensions primarily increase the mean net worth and benefit higher-wealth households, public pensions have a stronger equalizing effect, boosting median net worth and providing essential support to middle and lower-wealth groups. Including pension entitlements in household net worth calculations substantially reduces measured inequality, as shown by a drop in the Gini coefficient from 0.664 (excluding pensions) to 0.521 (including all pensions). This equalizing effect is driven primarily by vertical redistribution.

A joint income and wealth analysis yields richer insights into economic inequality in the Netherlands. Although income and wealth are broadly aligned for the majority of households, significant mismatches persist—particularly among low-income, high-wealth retirees and high-income, low-wealth entrepreneurs. These findings also challenge the prevailing notion of the Netherlands as a “nation of savers,” revealing that half of the population lacks sufficient resources to cover their consumption needs. Among retirees, this pattern of dissaving is intensified by the drawdown of pension entitlements, whereas younger households boosts their effective savings rates. Notably, within each income decile, households situated in the higher wealth brackets exhibit negative savings, largely due to demographic patterns in which older, asset-rich households begin to decumulate their wealth.

Wealth inequality has emerged as a central concern in contemporary economic research, not only due to its persistence but because of its far-reaching implications for social and economic stability (Vrooman *et al.*, 2014; Hoff *et al.*, 2021; SCP, 2024). Disparities in available resources are closely linked to divergent views on personal well-being, society, and politics (Hoff *et al.*, 2021), and recent policy research for the Netherlands highlights that rising separation between socioeconomic groups—in schools, neighborhoods, and the workplace—has led to increasingly disconnected social environments and weakened mutual understanding (SCP, 2024).

Public acceptance of inequality is not determined solely by its level, but by its perceived legitimacy: merit-based disparities are tolerated, those stemming from inheritance or passive capital are widely seen as unjust (Mijs, 2021; Ugur, 2021). And while the public sentiment is based on the perceived inequality, this does not necessarily align with the measured inequality. Individuals form beliefs about inequality through the lens of their local environment, leading to systematic misperceptions across the income spectrum (Knell & Stix, 2020). In such contexts, high-income individuals tend to underestimate inequality, while low-income groups often overestimate their relative disadvantage. In the Dutch case, this divergence is intensified by limited cross-class interaction (SCP, 2024), which distorts perceptions and challenges the legitimacy of statistical representations.

Compared to income, wealth is generally distributed far more unequally, reflecting the effects of capital accumulation, differential access to asset markets, and the intergenerational transfer of resources (Piketty, 2014; Saez & Zucman, 2016). The compounding nature of returns on financial and real assets systematically advantages high-wealth households, while limited participation in capital markets confines lower-income groups to minimal or no asset accumulation (Wolff, 2017).

Cross-national studies further demonstrate that wealth inequality is shaped by institutional differences in tax policy, labour markets, and social security systems (Balestra & Tonkin, 2018). In this context, the Netherlands presents a paradox: despite relatively low income inequality, wealth inequality is high—a phenomenon attributed in part to the exclusion of collectively funded pension entitlements from household wealth statistics (Van Bavel & Frankema, 2017). Waldenström (2024) finds that the expansion of pension systems in the postwar era had an equalizing effect by facilitating broader middle-class asset accumulation, especially in societies with strong social safety nets.

These findings contrast with much of the existing literature, which frequently argues that inequality is underestimated—either because the wealthiest households can conceal assets from authorities (Zucman, 2015), or because privately held businesses should be valued at market rather than book prices (Toussaint, 2024). This growing body of research underscores the importance of expanding analytical frameworks to include broader and more accurate concepts of wealth when assessing economic disparities.

The treatment of pension entitlements is a particularly salient example of the measurement gap. In countries like the Netherlands, occupational pensions constitute a major form of household wealth, yet they are typically excluded from wealth distribution statistics (Van Bavel & Salverda, 2014; OECD, 2015). At the same time, pensions remain abstract in the public imagination due to their deferred accessibility and institutional opacity, meaning they contribute little to individuals' perceived wealth positions (Ugur, 2021). However, in systems with generous public pensions, these entitlements may also crowd out private savings, particularly among lower-income groups. The extent of this "crowding out" effect remains contested: while early models (Feldstein, 1974) and subsequent empirical studies (e.g., Hubbard, 1986; Attanasio & Brugiavini, 2003; Sabelhaus & Volz, 2020) suggest a reduction in private saving due to public pension expectations, others argue that precautionary motives and saving for non-retirement purposes persist (Engen & Gale, 1997; Gale, 1998). Dutch evidence by Alessie *et al.* (2013) indicates only modest crowding out, more pronounced among lower-income households.

Several studies highlight the significant impact of pension entitlements on measured wealth inequality in the Netherlands. The Interdepartmental Policy Study on Wealth Distribution (Ministerie van Financiën, 2022) shows that the Netherlands ranks high in international comparisons of household wealth inequality, largely due to the exclusion of second-pillar pension wealth from standard balance sheet statistics. When these entitlements are included, the Gini coefficient for net wealth drops by 0.12 points, indicating that pension wealth functions as a hidden equalizer in the overall distribution. Similar results are found by Caminada, Goudswaard, and Knoef (2014), who on top of pension entitlements also incorporate life insurance and annuity rights and report a comparable reduction in inequality. In a related study, Kooiman and Lejour (2016) find an even stronger effect: in 2013, the inclusion of second-pillar pensions and capital insurance linked to home ownership reduced the Gini coefficient by 0.18 points. While the data sources and general approaches used in studies such as Caminada *et al.* (2014) and Kooiman and Lejour (2016) are broadly comparable to this study, a key distinction lies in the methodological alignment with the System of National Accounts (SNA). Specifically, those studies do not apply SNA-consistent techniques to recalculate accrued pension entitlements into net present values, and they entirely exclude public (first-pillar) pension rights from their analysis. This study addresses both gaps by integrating private and public pension entitlements in a manner that is harmonized with national accounting standards.

International research confirms that pension entitlements significantly affect wealth distribution outcomes. Bönke *et al.* (2019) show that including pension wealth in net worth calculations for Germany reduces the Gini coefficient by about one quarter, with the strongest gains in the lower half of the wealth distribution. This effect is more pronounced in Germany than in the U.S., due to the greater role of public pensions (Bönke *et al.*, 2020).

Our contribution to the literature lies in the uniquely integrated perspective on economic inequality by linking household-level distributions of occupational and public pension entitlements to the macroeconomic totals of the System of National Accounts (SNA). To our knowledge, no other country currently possesses a framework that simultaneously aligns both pillars of pension wealth—public and occupational—with the official SNA aggregates while also integrating income and savings measures drawn from the same national accounts framework. This allows for internally consistent measurement across wealth, income, and savings, capturing their interactions and enabling an unprecedented level of comparability across distributional domains.

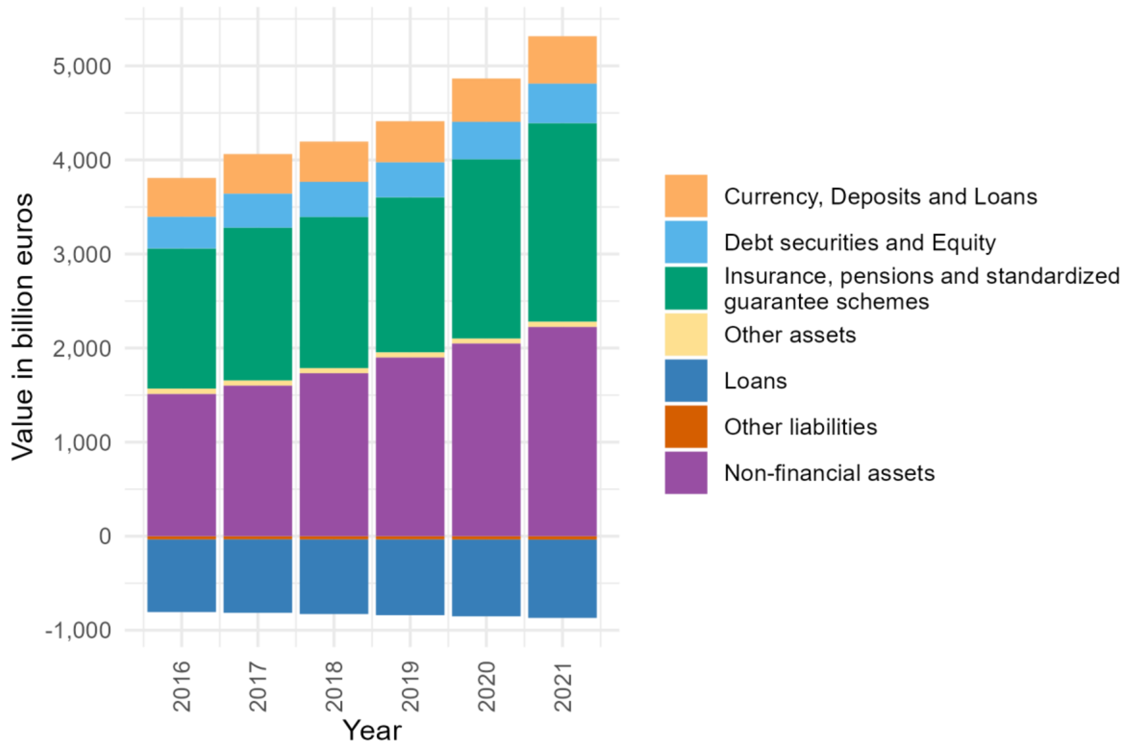
This chapter is structured as follows. Section 2.2 presents the methodology employed to construct wealth distributions that are consistent with the totals reported in the System of National Accounts (SNA). This section also details the approach used to estimate the total value of public pension entitlements and their distribution across the population. In Section 2.3, the results of the wealth distribution analysis are discussed, with particular attention to the impact of including pension entitlements on various inequality metrics. Additionally, the joint distribution of wealth and income is analyzed, and these dimension are linked through savings, providing a more comprehensive and nuanced perspective on economic inequality. Section 2.4 offers a summary of the main findings, draws key conclusions, and identifies important directions for future research.

2.2. Data and Methodology

2.2.1. Net Worth in the System of National Accounts

Our analysis is grounded in the concept of net worth as defined by the System of National Accounts (SNA), which includes both financial and non-financial assets, minus liabilities. The focus of this study is on the balance sheets of the household sector in the Netherlands.

Figure 2.1: Components of households' net worth, 2016-2021



Note: This figure presents households' net worth for 2016-2021, broken down by component. The values presented in this figure are aligned with the concept of net worth as defined by the System of National Accounts (SNA). Net worth is calculated as the total value of financial and non-financial assets held by households, minus their outstanding liabilities. In this context, non-financial assets primarily consist of owner-occupied dwellings, the underlying land, and business assets owned by the self-employed. Liabilities are predominantly composed of mortgage debt. Insurance, pensions, and standardized guarantee schemes include the occupational pension entitlement of households. It is important to note that public pension entitlements are not included in these figures, as they do not qualify as financial assets under the SNA framework.

Figure 2.1 shows the balance sheets of Dutch households from 2016 to 2021. As of the 2021 opening balance sheet, Dutch households held a total net worth of €4,446 billion, comprising €5,315 billion in assets, both financial and non-financial, and €869 billion in liabilities. Among the assets, non-financial assets are the largest component (€2,224 billion), comprising for the largest part of households' dwellings and land underlying dwellings. Furthermore the non-financial assets include the assets held by self-employed as part of their business enterprise, such as machines, vehicles, or inventories.

The insurance, pensions and standardized guarantee schemes include the pension entitlements as their largest component, but also non-life insurance technical reserves, life insurance and annuity entitlements, entitlements of non-pension benefits, and provisions for calls under standardized guarantee schemes. The occupational pension entitlements amount to €1,906 billion, which corresponds to 219% of GDP. This is the value of the entitlements households own, which differs from the value of the assets pension funds hold on their behalf, mainly because of the capital buffers that pension funds must maintain. For the purposes of this study, we analyze the effect of only these occupational pension entitlements on wealth inequality, as voluntary pensions are harder to quantify. Life insurance and annuity entitlements provide the best available proxy for voluntary pensions, but these financial instruments are not exclusively earmarked for retirement. Furthermore, households may save for retirement in other ways, such as building stock portfolios or maintaining savings accounts.

Currency, deposits and loans amount to €505 bn euros, these are for the largest part deposits held in euros, but they include foreign bank accounts as well. The loans households hold as an assets are mainly mortgage claims that households have on one another.

Debt securities and equity mainly represent the holdings that households have in the stock market, either directly through listed shares, or through investment funds. Dutch households tend to invest primarily in the Dutch stock market when listed shares are considered, and abroad through investment funds. The largest component of this net worth category consists of non-listed shares, reflecting household ownership in privately held enterprises. These firms are not publicly traded and are typically valued at book value. As demonstrated by Toussaint (2024), revaluing these private businesses to reflect market value results in an upward revision of the wealth share held by the top 1% by approximately 3 to 5 percentage points on average during the period 2008–2020. In the present study, however, we adopt the national accounts aggregates as our reference data. We acknowledge that methodological choices—such as valuation assumptions—may influence the distributional outcomes, but we maintain consistency with official benchmarks for comparability and transparency.

The other assets and the other liabilities are of lesser importance for the households sector as a whole. These consist of financial derivatives, employee stock options, and other accounts receivable/payable, which together amount to €56 bn euros in assets and €36 bn euros in liabilities.

Finally, the liabilities largely consist of loans. These comprise, among other things, student loans, consumer credit, and mortgage loans. The latter component amounts to €752 bn euros in 2021, or 87 percent of total liabilities.

2.2.2. Distribution of Net Worth

Our methodology to create our distributional wealth accounts builds on the household database described by Bruil (2023), which covers the entire Dutch resident population and corresponds to the household sector in the SNA. To capture the dynamic nature of the household population, we construct the dataset based on two reference dates: January 1st and December 31st of the research year. This dual-point approach allows us to identify demographic flows—such as births, deaths, immigration, and emigration—by comparing the presence or absence of individuals across these dates. Individuals who appear in the population on January 1st but not on December 31st, and who are not recorded as deceased, are classified as emigrants. Conversely, individuals present on December 31st but not on January 1st, and who were born before the research year, are treated as immigrants. Flows that occur entirely within the year and are not reflected in either population snapshot—for example, individuals who immigrate and later emigrate or pass away within the same year—are not captured.

We use January 1st as the reference date for determining household-level characteristics, including household composition. This choice means that some households may gain or lose members during the year (e.g., through birth, partnership, or separation), but those changes are not reflected in derived characteristics. We accept this limitation as a consistent trade-off, recognizing that any alternative reference date would face similar issues.

Each individual in the dataset is described by a set of background characteristics, including gender, year of birth, and position within the household. Moreover, each person is linked to a specific household, which allows for both aggregation to the household level and disaggregation back to the individual level. An anonymized personal identifier enables us to link individuals to other administrative datasets on a one-to-one basis.

This study uses the Wealth Statistics, a component of the Integrated Income and Wealth Statistics (IIWS) compiled by Statistics Netherlands (CBS) to distribute most wealth components of the National Accounts. These data provide detailed information on the net wealth positions of households as observed on January 1st of each year, aligning with the opening balance sheet commonly used in national accounting. The Wealth Statistics are primarily derived from administrative tax records, including income tax filings, property registers, and business ownership declarations. They offer comprehensive coverage of household assets and liabilities, and are used to distribute deposits, debt securities, equity holdings in listed and non-listed shares or investment funds, alongside outstanding debts including mortgages and other loans.

While the dataset is rooted in tax-based administrative sources, it is supplemented with adjustments and imputations to address known gaps and to reconcile differences between the microdata and the corresponding macroeconomic totals. For example, mortgage-linked savings and investment products, which are omitted from tax records but included in national accounts aggregates, are attributed to mortgage holders. Similarly, loans associated with self-employment activity—which appear as part of business equity in the microdata but are treated as separate liabilities in national accounting—are estimated using observed interest flows and allocated to the relevant households. Any remaining differences are allocated to households proportional to the observed values in the microdata.

The Wealth Statistics form the basis for most widely used measures of wealth inequality in the Netherlands, including those regularly published by Statistics Netherlands and cited in international comparisons. In contrast, the inequality measures presented in this study differ in two important respects. First, they incorporate additional adjustments that enhance consistency with the full national accounts framework. Because these adjustments can affect the aggregate levels of wealth, they may also influence measured inequality. Second, they include wealth components that are not covered by the Wealth Statistics. As a result, our estimates reflect a broader and conceptually more comprehensive notion of household economic resources.

While occupational pension entitlements represent by far the largest component included in the national accounts but omitted from the Wealth Statistics, they are not the only missing element. The entire category of insurance, pension, and standardized guarantee schemes is excluded from the microdata. In this study, we allocate non-life insurance technical reserves and provisions for calls under standardized guarantees across the population in proportion to relevant income or consumption components, following the methodology described in Bruil (2023). For life insurance and annuity entitlements, we rely on data from the 2014 wave of the Household Finance and Consumption Survey (HFCS), which contains information on household assets and liabilities across the euro area. While the HFCS provides detailed information on household assets and liabilities, its coverage of top incomes and top wealth is limited due to sample design constraints and underrepresentation of the wealthiest households. The Dutch sample for this wave comprised only approximately 1,200 households, and the asset and liability information was derived from existing national surveys. As acknowledged in official documentation, this wave is subject to greater sampling uncertainty, and variations in questionnaire design may have influenced the reported figures. From the HFCS data, we derive average voluntary pension entitlements by age and gender, which are then imputed into the household database. These values are subsequently scaled to align with macroeconomic totals. It should be noted that the use of age- and gender-specific averages implies a relatively uniform distribution of these entitlements across the population, potentially understating heterogeneity in the underlying asset holdings.

For mandatory, employment-related pensions (second-pillar schemes), we rely on the Pension Claims Statistics (PCS), which provide detailed information on accrued-to-date pension entitlements for individuals still in the accumulation phase. These entitlements represent the value of pension benefits earned up to the current point in time. To align with the national accounting framework, we convert these accrued rights into net present values using discount factors from the Interest Rate Term Structure (IRTS). The IRTS reflects term-dependent interest rates used to discount future pension liabilities and serves as the regulatory standard mandated by the Dutch Central Bank for valuing such obligations. Its term structure reflects the duration of liabilities: for older individuals with short expected durations, discount rates are often negative, meaning the present value of liabilities exceeds the nominal sum of expected payouts. For younger cohorts, higher discount rates apply, as funds are assumed to earn returns over the longer accumulation period.

For individuals who are already retired and receiving pension income, PCS data are not available. Instead, we use the actual pension benefits from the IIWS. These observed benefits are again converted into entitlements by applying the same methodology as for those in the accumulation phase. Our approach ensures consistency between the microdata valuation and the macroeconomic treatment in the National Accounts. In effect, we replicate the macro-level valuation techniques of pension funds at the micro level, enhancing comparability. Any residual differences between the calculated micro totals and National Accounts aggregates are reconciled through proportional allocation, preserving the integrity of the national total while ensuring individual-level detail.

Our approach differs in key respects from earlier Dutch studies on pension wealth distribution, particularly in its close methodological alignment with the System of National Accounts (SNA). Like the Interdepartmental Policy Study on Wealth Distribution (IBO), we rely on administrative datasets and distinguish between individuals accruing pension rights and those receiving pension benefits. However, the results in this study do not reconcile with the national macroeconomic totals but are consistent with the microdata approach used by Statistics Netherlands (CBS, 2020). In 2018 alone, the level of total entitlements differed by approximately €200 billion. Moreover, trends over time diverge, as national accounts figures are highly sensitive to fluctuations in the IRTS, whereas the microdata-based estimates reflect a more stable valuation approach. Importantly, the use of the IRTS valuation method may also influence the distributional outcomes, as term-dependent discount rates vary by age and pension maturity, potentially altering the relative value of entitlements across households.

Other studies, such as those by Caminada *et al.* (2014) and Kooiman and Lejour (2016), also rely on similar underlying data but follow distinct valuation approaches. While these studies contribute important distributional insights, they do not explicitly align with the macroeconomic aggregates found in the SNA. For instance, Caminada *et al.* (2014) include a broader set of entitlements, such as annuities and life insurance, and Kooiman and Lejour (2016) estimate pension income using multi-year averages, a valid method for smoothing variability. In contrast, our framework seeks to replicate the macroeconomic pension valuations applied by Dutch pension funds and integrate them into a micro-level database. This allows us to capture both household-level heterogeneity and ensure consistency with national accounts, providing a detailed and policy-relevant view of pension wealth distribution.

Finally, non-financial assets primarily comprise owner-occupied dwellings, land underlying those dwellings, and business assets held by the self-employed. For dwellings and land, we use data from the WOZ register, which provides official property valuations. Each property is linked to its registered owner, allowing for integration with our database through the unique personal identifier. The distribution of self-employed business assets is based on the consumption of fixed capital, following the methodology and data outlined in Bruil (2023). This approach ensures that both income and wealth components are consistently derived within a single integrated dataset, enhancing internal coherence in distributional analysis.

2.2.3. Extended Net Worth

For the extended net worth concept, we also include public pension entitlements following the methodology outlined in the Technical Compilation Guide of the supplementary pension table (Eurostat, European Central Bank, 2011) and further applied in the Netherlands by CBS (2015). The supplementary pension table is designed with the purpose to address the unique characteristics of pension systems, especially those involving government participation, and to enhance comparability and understanding of pension-related liabilities across EU member states.

The estimation of public pension entitlements in the Netherlands follows a methodological framework that parallels our treatment of occupational pensions, ensuring consistency in approach and comparability across pension pillars. As with second-pillar pensions, the population is divided into two groups: individuals currently receiving benefits and those still accruing entitlements. For benefit recipients, we use observed public pension benefits from the IIWS, which are converted into net present values using cohort-specific life expectancies and statutory retirement ages. For those accruing rights, we model future entitlements based on a linear accrual assumption of 2% per year of residency, up to the average state pension benefit at the retirement age. A complete benefit is earned after 50 years of residency; shorter residency periods result in proportional pension gaps. By applying a uniform accrual profile, we implicitly assume identical shortfalls across the population, which may underestimate actual variation in residency histories. Future research could explore additional data sources to refine this aspect of the estimation.

Similar to occupational pensions, the present value of public pension entitlements is calculated using the Interest Rate Term Structure (IRTS). This choice ensures methodological coherence, as pension funds in the Netherlands are required to use the IRTS for valuing their liabilities, and it allows us to apply term-specific discounting that captures variation in entitlement maturity across age groups. In contrast, Eurostat's standard 3% fixed discount rate does not account for these variations and has proven overly optimistic compared to the IRTS, especially for short durations where rates have occasionally been negative.

Additionally, we adopt the accrued benefit obligation (ABO) approach rather than the projected benefit obligation (PBO) recommended by Eurostat. The ABO reflects only entitlements accrued to date, excluding assumptions about future wage growth or indexation. This choice mirrors our treatment of occupational pensions and is more consistent with System of National Accounts (SNA) principles. Finally, we apply a closed-group perspective, assuming no new entrants, which aligns with national accounting and pension fund reporting standards but contrasts with approaches aimed at assessing long-term system sustainability. The macroeconomic total for public pension entitlements presented in this study is directly based on microdata calculations, ensuring full consistency between individual-level distributions and the aggregate figure.

2.3. Results

2.3.1. The Role of Pension Entitlements in Wealth Inequality

Net Worth Levels Across Wealth Concepts

Table 2.1 presents a comprehensive comparison of household net worth in 2021 under three different concepts: the SNA baseline, a lower bound excluding all pension entitlements, and an upper bound that includes both occupational and public pensions. The results reveal the significant impact of pension wealth on the aggregate level and distribution of household net worth. Under the SNA baseline, the total net worth is recorded at 4,446.2 billion euros. When pension entitlements are excluded, this figure drops to 2,540.1 billion euros, underscoring the significance of pensions as a major component of household wealth. Conversely, the inclusion of both occupational and public pensions raises the total net worth to 5,946.1 billion euros.

This change in level is also reflected in the mean wealth per household and the median values. Using the SNA concept of net worth, the mean net worth per household is 528.6 thousand euros. Excluding all pension entitlements, the mean falls to 302 thousand euros, while including all pension entitlements increases the mean to 707 thousand euros. The median net worth per household is 308.4 thousand euros under the SNA baseline. When pensions are excluded, the median falls sharply to 149.9 thousand euros. Including all pension entitlements increases the median to 481.8 thousand euros, further emphasizing the redistributive role of pension wealth.

These findings indicate that pension wealth—particularly when inclusive of both public and occupational schemes—plays a crucial role in mitigating wealth inequality. The omission of pension entitlements exaggerates wealth concentration, while their inclusion serves to substantially moderate these disparities. The impact of including different types of pension entitlements on wealth distribution varies between mean and median net worth, reflecting differences in how these pensions affect wealth across the household spectrum. When only occupational pensions are included, the median net worth per household increases by 159 thousand euros, but it rises even more - by 173 thousand euros - when public pensions are also included. On the other hand, the average rises more through the inclusion of occupational pension entitlements – by 226 thousand euros – compared to 179 thousand euros through public pensions. This shows that public pensions have a particularly strong impact on wealth for the median household, because public pensions are distributed more evenly across the population and provide a significant wealth boost to households in the bottom and middle of the wealth distribution.

The data also show a notable decrease in the incidence of negative net worth. When pension entitlements are excluded, 349 thousand households have net worth below zero. Including occupational pensions alone reduces this to 213 thousand households, while adding public pensions lowers this further to just 54 thousand. This highlights the critical role of pension wealth—especially public pensions—in lifting households above the zero net worth threshold, thus reducing financial vulnerability among lower-wealth groups.

Table 2.1: Household Net Worth and Inequality Metrics Under Alternative Wealth Concepts (2021)

		SNA	SNA, excluding pension entitlements	SNA, including public pension entitlements
Descriptives				
Sum of Net Worth	bn euros	4446.2	2540.1	5946.1
Mean net worth per household	thousand euros	528.6	302	707
Median net worth per household	thousand euros	308.4	149.9	481.8
Number of households	thousands	8410706	8410706	8410706
Number of households with positieve net worth		8197640	8061805	8356477
Number of households with negative net worth		213066	348901	54229
Shares				
Decile 1 - lowest net worth group	share in total	-0.003	-0.012	0.002
Decile 2		0.006	0.006	0.015
Decile 3		0.014	0.011	0.028
Decile 4		0.027	0.017	0.041
Decile 5		0.047	0.036	0.058
Decile 6		0.071	0.064	0.079
Decile 7		0.099	0.094	0.105
Decile 8		0.136	0.131	0.137
Decile 9		0.191	0.186	0.183
Decile 10 - highest net worth group		0.412	0.467	0.352
Top 1%		0.112	0.153	0.088
Top 0.1%		0.034	0.054	0.026
Ratios and indicators				
Q5 / Q1 ratio		219.7	-106.4	31.2
D10 / D1 ratio		-129.5	-38.7	160.9
Palma (10/40)		9.4	21	4.1
Gini		0.604	0.664	0.521

Note: This table presents the distribution of household net worth for 2021 across deciles and top wealth percentiles for three different net worth concepts: Net worth as defined by the SNA baseline (excluding public pension entitlements), a lower bound (excluding both public and occupational pensions), and an upper bound (including both types of pensions). The first row displays the aggregate net worth (in billions of euros) under each concept, which serves as the denominator for all subsequent share calculations. Decile rankings are derived separately for each net worth concept, implying that households may be assigned to different deciles depending on the inclusion or exclusion of pension entitlements. In addition, the table reports the shares of the top 1% and top 0.1% of households, offering a more granular perspective on wealth concentration at the upper end. To further illustrate inequality, three widely used indicators are included: the Q5/Q1 ratio (the ratio of net worth in the top and bottom quintiles), the D10/D1 ratio (the ratio of net worth in the top and bottom deciles), and the Palma ratio (the ratio of net worth held by the top 10% relative to the bottom 40%). The Gini coefficient is also reported, capturing overall inequality in the net worth distribution on a scale from 0 (perfect equality) to 1 (perfect inequality).

The results emphasize that the definition of net worth significantly alters both the aggregate level and median position of households in the distribution. Excluding pension wealth underestimates total resources available for lifetime consumption and exaggerates wealth inequality, while including both public and occupational entitlements offers a more comprehensive and equitable picture of economic well-being.

Impact on Inequality Metrics

To quantify the distributional impact of pension entitlements, we begin by examining the Gini coefficient—arguably the most widely used summary measure of inequality. Under the SNA baseline concept, the Gini coefficient in 2021 is 0.604. Excluding pension entitlements increases this value to 0.664, while including both occupational and public pensions reduces it to 0.521. This substantial difference underscores the equalizing role of pension wealth in shaping overall net worth distribution. Incorporating pension entitlements into the net worth definition reduces the Gini coefficient by 22%, a substantial decline comparable to the effect reported by Bönke (2019).

To further understand how pensions contribute to this effect, we apply the redistributive decomposition framework developed by Lambert (1985, 2001), which separates the total redistributive effect (RE) into two components: vertical equity (VE), reflecting inequality reduction without changing household ranks, and reranking (RR), which captures shifts in ordinal positions. In our results, the inclusion of pension entitlements reduces the Gini coefficient by 0.143 points (RE). Of this reduction, 0.227 points stem from vertical redistribution (VE), while 0.084 points are offset by reranking (RR). This reranking reflects the unique distribution of pension rights, which are typically higher for older households regardless of their position in other wealth dimensions. As a result, pension entitlements not only compress the wealth distribution but also alter its internal structure.

Beyond the Gini, which is as a measure most sensitive to the middle of the distribution, it is essential to consider how pension inclusion affects different segments of the distribution. A key finding is the notable improvement in the bottom deciles' wealth share when pensions are accounted for. In both the lower bound concept (excluding pensions), and the SNA concept, the bottom 10% of households have negative net worth. This changes when public pension entitlements are included. Negative net worth for the lower decile doesn't mean that all households in the bottom decile have negative net worth, but the combined net worth of the households in this net worth decile are negative. The comparison between the upper and lower bound estimates reveals that net worth shares increase across the first eight deciles of the distribution.

To complement these insights, we also examine the Palma index, which captures the ratio of the wealth share of the top 10% to that of the bottom 40%. This metric is particularly valuable as it emphasizes disparities at the distributional extremes which are often the focus of public concern and political discourse. In our analysis, the Palma index falls significantly when pensions are included, again highlighting the redistributive weight of pension wealth in lifting the lower segments while curbing top-end concentration.

Trends Over Time (2016–2021)

While cross-sectional snapshots provide insight into the level of wealth inequality at a given point in time, it is the temporal dynamics that offer a deeper understanding of how inequality evolves, and how it is experienced and perceived by society. Public tolerance tends to be higher when disparities are seen as narrowing or as outcomes of merit, and significantly lower when inequality is perceived to be widening or rooted in structural unfairness such as inheritance or capital gains (Knell & Stix, 2020; Mijs *et al.*, 2020; Ugur, 2021).

To track the evolution of wealth inequality over time, we focus on two complementary indicators: the Gini coefficient and the Palma index, reported consistently across the three net worth concepts. As shown in Table 2.2, wealth inequality declined across all concepts between 2016 and 2021. The Gini coefficient under the SNA baseline decreased from 0.652 to 0.604, while the upper bound Gini—incorporating also the public pension entitlements—fell as well, from 0.572 to 0.521. When all pensions are excluded, the Gini remains significantly higher throughout the period, though it declined the most from 0.766 to 0.664.

Table 2.2: Time Trends in Wealth Inequality Metrics (Gini coefficient and Palma index) by Net Worth Concept (2016–2021)

	Gini coefficient	Gini coefficient	Gini coefficient	Palma index	Palma index	Palma index
Year	SNA	SNA, excluding pension entitlements	SNA, including public pension entitlements	SNA	SNA, excluding pension entitlements	SNA, including public pension entitlements
2016	0.652	0.766	0.572	13.1	-5140.7	5.9
2017	0.651	0.732	0.572	13.6	60.8	5.9
2018	0.640	0.733	0.566	13.6	315.6	5.8
2019	0.629	0.706	0.558	12.1	53	5.5
2020	0.615	0.682	0.526	10.4	28.8	4.2
2021	0.604	0.664	0.521	9.4	21	4.1

Note: This table displays trends in Dutch wealth inequality from 2016 to 2021, using three net worth concepts: SNA (baseline), lower bound (excluding all pensions), and upper bound (including public pensions). The table reports annual values of the Gini coefficient and the Palma ratio, highlighting how the inclusion of pension entitlements affects both the level and direction of inequality over time. For a full overview, including all distributional statistics by year, see Appendix A.

The evolution of the Palma index between 2016 and 2021 reveals nuanced trends across the three net worth concepts. Under the SNA baseline, the index declines overall from 13.1 to 9.4, signaling a reduction in the relative wealth concentration of the top 10% compared to the bottom 40%. However, unlike the Gini coefficient—which decreases steadily each year under the SNA concept—the Palma index shows a slight increase from 13.1 in 2016 to 13.6 in 2017 before resuming its downward trend. This temporary divergence was driven by a decline in the net worth share of the bottom 40 percent, while the share held by the top 10 percent remained unchanged. As a result, the Palma index rose slightly in 2017, indicating a relative worsening of inequality at the distributional extremes, even as the Gini coefficient suggested a continued overall decline.

When pension entitlements are fully included (upper bound), the Palma index is markedly lower—falling from 5.9 in 2016 to 4.1 in 2021—and also more stable over time. This reflects the redistributive effect of pensions, particularly public entitlements, which are more evenly distributed and serve to elevate the net worth of households in the lower part of the distribution. Conversely, the lower bound concept (excluding all pensions) yields extremely volatile Palma values, including a large negative figure in 2016 (–5140.7). This arises because the bottom 40% of households collectively hold negative net worth, with the severely negative values in the bottom decile not sufficiently offset by near-zero or modest wealth in the second to fourth deciles. This results in a negative denominator in the Palma ratio, making the measure unstable and difficult to interpret. Even as the lower bound series becomes more stable in later years, it continues to reflect the distortive impact of excluding pension wealth from net worth concepts. A full set of tables, structured identically to Table 2.1 but covering all years from 2016 to 2021, is presented in Section 2.6 Appendix A.

2.3.2. Demographic Profiles of Wealth

While wealth distribution by net worth group provides essential insights into economic stratification, a comprehensive analysis of wealth inequality requires examining additional household characteristics. To better understand the drivers of household wealth inequality, we applied dominance analysis—a statistical technique used to assess the relative importance of multiple explanatory variables in predicting an outcome, in this case, net worth. This method decomposes the explained variance of net worth across a set of explanatory variables, producing additive contributions that sum to 100%. We focus on four key demographic and socioeconomic variables: homeownership status, age of the household head, household composition, and region. By performing this analysis separately for each wealth concept—SNA baseline, lower bound (excluding pension entitlements), and upper bound (including both occupational and public pensions)—we can evaluate how the importance of these factors shifts depending on how wealth is defined. This provides a nuanced understanding of the determinants of wealth across the distribution and over time.

Table 2.3: Dominance Analysis by Net Worth concept, 2021

	SNA	SNA, excluding pension entitlements	SNA, including public pension entitlements
Age of the head of the household	15%	9%	19%
Region	2%	3%	1%
Household composition	27%	22%	34%
Homeownership status	56%	66%	46%
	100%	100%	100%

Note: This table presents the dominance analysis results for 2021, showing the relative contribution of selected household characteristics to the explained variance in net worth, based on three wealth concepts: SNA, lower bound, and upper bound. Results are expressed as percentage shares summing to 100%. Dominance results for the years 2016–2021 are provided in Appendix B.

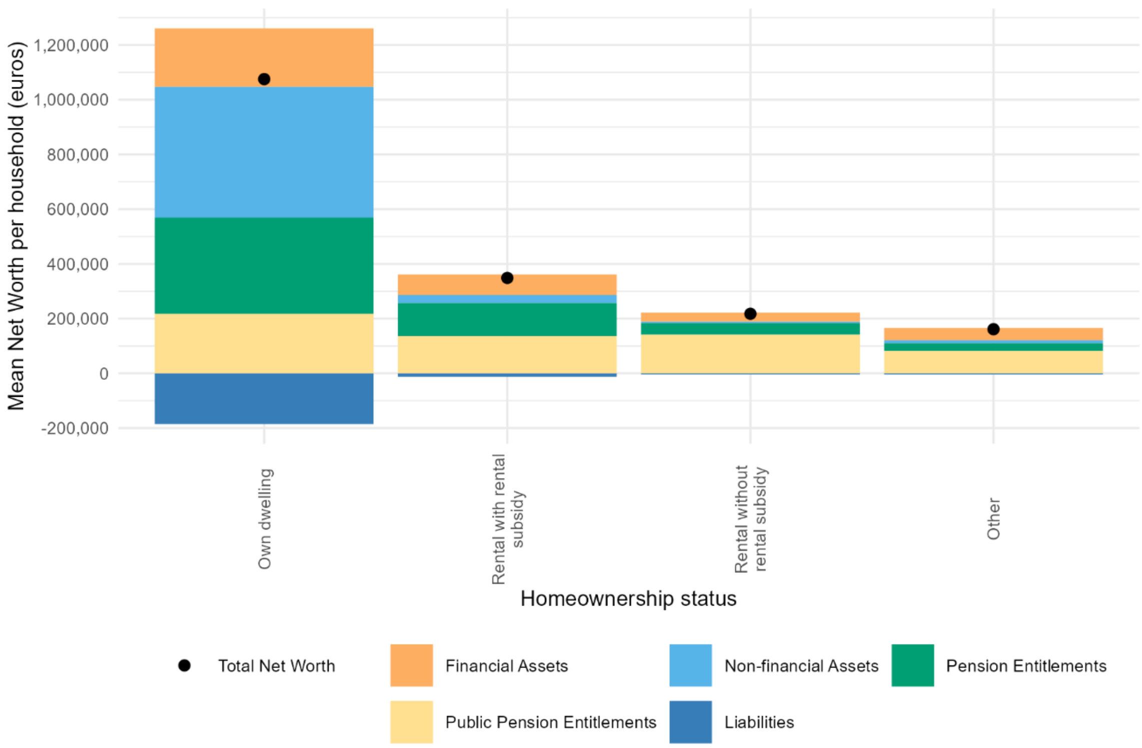
Table 2.3 shows that across all three concepts, homeownership status remains the most influential factor, although its dominance declines substantially when pension entitlements are included—falling from 66% under the lower bound to 46% in the upper bound. This reduction reflects that when pension entitlements are incorporated into the net worth concept, a larger share of the explained variance is absorbed by these entitlements, thereby diminishing the relative explanatory power of homeownership. In contrast, both age of the household head and household composition gain explanatory weight when pension wealth is considered. The importance of the age of the head of the household increases from 9% under the lower bound to 19% under the upper bound, while household composition rises from 22% to 34%. These patterns are consistent with the life-cycle accumulation of pensions: older households and multi-person households tend to accrue larger pension entitlements, thus increasing the correlation between these characteristics and total net worth when pensions are included. Regional variation, by comparison, consistently contributes very little to explaining net worth—no more than 3% under any concept—meaning that geographic differences in wealth within the Netherlands are relatively modest compared to other factors.

It is important to note that while this analysis captures the explanatory power of these four observable characteristics, the accumulation of wealth is influenced by a broader set of determinants—including for instance level of education, inheritance, labour market history, and financial behavior—that are beyond the scope of this model. Still, the results underscore the central role of homeownership, and the increasing relevance of age and household composition, in shaping net worth as pension entitlements are included in the net worth concept.

Homeownership stands out as the most significant predictor of household wealth. This finding aligns with broader European trends, where property ownership plays a crucial role in wealth accumulation. The European Central Bank (ECB) has noted that the recent property boom has contributed to a decline in wealth inequality across the euro area, as a large middle class with widespread property ownership benefited from rising house prices (ECB, 2024). Also Waldenström (2024) shows that the accumulation of housing wealth among the middle class has been a primary factor, together with pension assets, in producing greater equality in wealth distribution in Western societies.

Non-financial assets, primarily dwellings and land underlying dwellings, constitute a major component of household net worth and are strongly associated with homeownership. Households that own their dwellings exhibit a mean net worth of 1.1 million euros, of which approximately 478 thousand euros consists of non-financial assets. Although this group carries the bulk of household liabilities—mostly in the form of mortgage debt—these debts are typically outweighed by the value of their housing assets (see Figure 2.2). In contrast, renter households possess significantly fewer non-financial assets and little to no housing-related debt. For these households, the inclusion of pension entitlements substantially boosts their net worth, highlighting the importance of pensions in wealth accumulation among non-homeowners. This is especially true for households that receive rental subsidies, because these are more often elderly households.

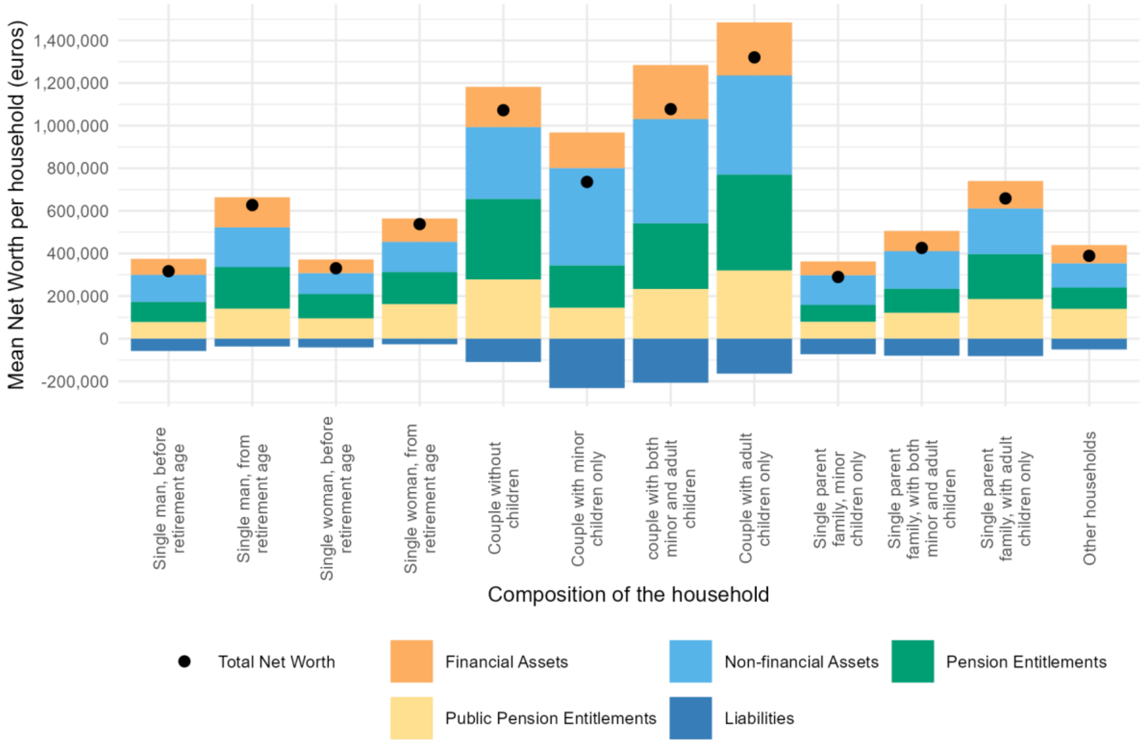
Figure 2.2: Net Worth by Homeownership status of the Household (2021)



Note: This figure presents the mean net worth per household for 2021, disaggregated by homeownership status. Households are classified as either homeowners or renters, with the latter further subdivided into those receiving rental subsidies and those without. The category "Other" includes households residing in institutions, collective households, or cases where homeownership status is unknown.

As indicated by the dominance analysis, household composition emerges as a key factor in explaining variations in net worth, second only to homeownership. This relationship reflects underlying lifecycle dynamics that shape wealth accumulation. Figure 2.3 shows that single-person households post-retirement possess higher net worth compared to pre-retirement singles, while the net worth of couples and single-parent households increases as their children age, reflecting different phases of the lifecycle. Couples with adult children show the highest average net worth of 1.3 million euros, with pension entitlements comprising over half of this figure. On the other end of the spectrum, single-parent families with only minor children hold the lowest net worth (290 thousand euros), with almost half of this amount in non-financial assets. Pension entitlements, both public and occupational, amount to 158 thousand euros for these households, making it a crucial component of their total net worth.

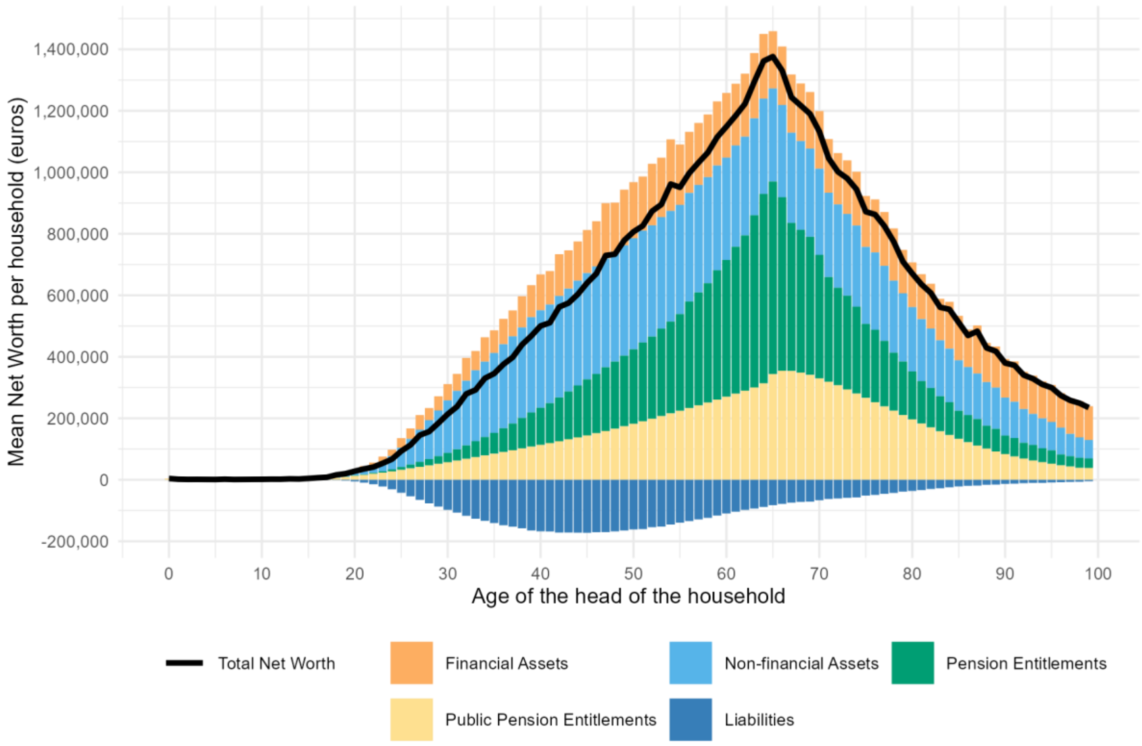
Figure 2.3: Net Worth by Composition of the Household (2021)



Note: The figure above displays the mean net worth per household by household composition for 2021. Single men and single women are further disaggregated by retirement age status, using the official retirement age of 66 years and 3 months in 2021 as the threshold. The category "Other households" includes household structures that contain additional adults who are neither part of a couple nor classified as children.

While household composition offers indirect insights into lifecycle stages, age of the household head provides a more direct measure of lifecycle progression (see Figure 2.4). However, as age is recorded at the individual level and used to characterize the household, certain limitations remain—particularly in households with multiple adults. Despite these caveats, age remains a powerful determinant of net worth, especially through its association with pension entitlements. Pension entitlements increase with the age of the household head, peaking around the average retirement age—65.4 years in 2021—while the official retirement age for public pensions was 66.3 years in that year. Entitlements, by design, reach their maximum upon retirement and gradually decline thereafter. Although financial assets also grow with age, their increase is notably less pronounced than that of pension entitlements, and these assets show minimal reduction post-retirement, suggesting they are not primarily used to finance consumption. Non-financial assets, comprising dwellings, land underlying dwelling, and self-employed business assets, peak at the ages of 51 years old. Household liabilities predominantly consist of mortgage loans. The liabilities peak for the group of 45 years old, amounting to an average of 172 thousand euros. Net worth is highest for the age group 65, averaging 1,376 thousand euros, largely driven by the pension entitlements. Excluding these entitlements net worth is highest for the age group of 54 years old, amounting to 447 thousand euros per household.

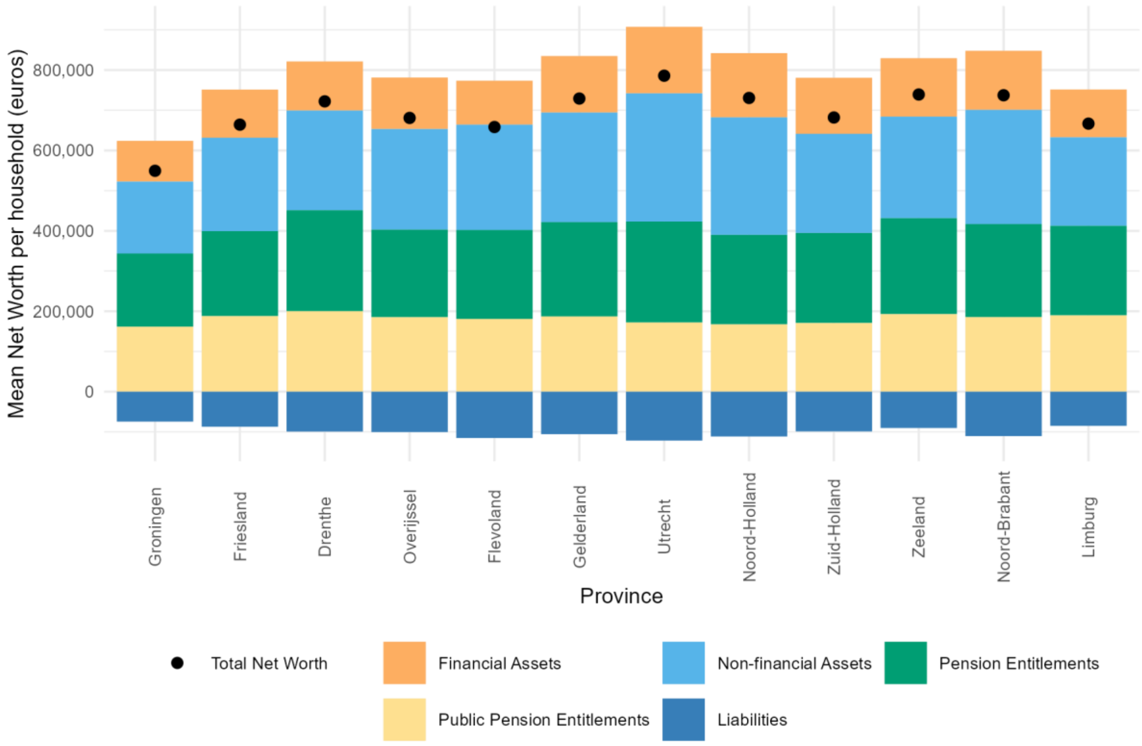
Figure 2.4: Net Worth by Age of the Head of the Household (2021)



Note: This figure presents mean net worth per household by the age of the household head for 2021. Ages above 100 are grouped into the 100-year category. Age is recorded as an individual characteristic and multiple age groups may be represented within a single household, though the household is classified by the age of its designated head.

As confirmed by the dominance analysis, regional characteristics (see Figure 2.5) contribute minimally to explaining wealth differences across households, underscoring the relatively modest role of geographic location in the Netherlands' wealth distribution. Nevertheless, modest regional disparities persist and reflect underlying demographic and housing market patterns. Net worth is highest in Utrecht, driven by elevated housing prices and substantial non-financial asset values. In contrast, Groningen reports the lowest average net worth, attributed to lower housing prices and comparatively smaller pension entitlements, indicating a younger population profile in that region.

Figure 2.5: Net Worth by Province of the Household (2021)



Note: This figure presents mean net worth per household by province of residence for 2021.

2.3.3. Joint Distribution of Income, Wealth, and Savings

Mapping the Income–Wealth Distribution

While the preceding sections analyzed wealth in isolation, a joint income-wealth perspective provides deeper insight into the mechanisms behind economic inequality. Wealth and income represent distinct yet interconnected dimensions of household economic well-being: income captures the flow of resources available for consumption and saving in the short term, whereas wealth reflects the accumulated stock of resources built up over time. Combining these two dimensions allows for a more comprehensive analysis of inequality.

This approach is particularly relevant in the Dutch context, where income inequality is relatively low by international standards, yet wealth inequality is substantially higher. This apparent paradox has raised questions about how institutional arrangements—especially the pension system—affect savings behavior and the accumulation of assets across income and wealth groups.

An integrated perspective helps assess whether high-income households systematically rank among the wealthiest, or whether mismatches exist, for instance due to lifecycle effects. By mapping income groups against net worth groups, the joint distribution captures the alignment between short-term financial resources and long-term economic security. It reveals which population segments hold both high income and high wealth—and which do not. This structure allows us to distinguish between groups who are income-poor but asset-rich and those who are both income- and wealth-poor, highlighting economic vulnerability that may be overlooked in separate analyses.

In constructing the joint distribution, households are ranked simultaneously by their disposable income and their net worth, using the concepts described in this studies. Disposable income is taken from the dataset by Bruil (2023), however we did not equivalise income in this analysis. While equivalisation is common in income inequality studies—particularly to enable meaningful comparisons across households of different sizes—it its application to wealth remains debated (Jantti *et al.,* 2013). Given our primary focus on net worth as a stock variable and the role of income primarily as a flow linked to savings rather than consumption, we report the joint distribution without applying equivalence adjustments to either dimension.

Table 2.4: Net Worth Shares by Income and Net Worth (upper bound) rankings (2021)

		Wealth group											
		total	**1st decile**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10th decile**	**Top 1%**	**Top 0.1%**
Income group	**total**	**1.000**	**0.002**	**0.015**	**0.028**	**0.041**	**0.058**	**0.079**	**0.105**	**0.137**	**0.183**	**0.352**	**0.088**	**0.026**
	1st decile	**0.047**	0.001	0.003	0.005	0.004	0.002	0.002	0.001	0.001	0.001	0.025	0.018	0.006
	2	**0.033**	0.001	0.003	0.006	0.009	0.006	0.003	0.002	0.001	0.001	0.003	0.001	0.000
	3	**0.048**	0.001	0.002	0.003	0.006	0.010	0.010	0.006	0.003	0.003	0.004	0.001	0.000
	4	**0.066**	0.001	0.002	0.003	0.004	0.007	0.013	0.016	0.010	0.006	0.006	0.001	0.000
	5	**0.089**	0.000	0.002	0.003	0.004	0.005	0.008	0.015	0.024	0.017	0.011	0.002	0.000
	6	**0.108**	0.000	0.001	0.002	0.004	0.006	0.007	0.011	0.019	0.032	0.025	0.003	0.001
	7	**0.116**	0.000	0.001	0.002	0.004	0.007	0.009	0.011	0.015	0.027	0.040	0.003	0.000
	8	**0.122**	0.000	0.001	0.002	0.004	0.008	0.012	0.014	0.016	0.022	0.045	0.005	0.001
	9	**0.143**	0.000	0.000	0.001	0.002	0.006	0.012	0.018	0.023	0.029	0.052	0.008	0.001
	10th decile	**0.227**	-0.001	0.000	0.000	0.001	0.002	0.005	0.011	0.024	0.045	0.141	0.046	0.016
	Top 1%	**0.045**	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.042	0.024	0.012
	Top 0.1%	**0.010**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.010	0.006

Note: This table presents the household net worth shares across income and net worth groups for the year 2021. Income refers to non-equivalised disposable household income, while net worth is defined according to the upper bound concept, which includes all pension entitlements, including public pensions. The column totals correspond to the net worth distribution shown in Table 1, now disaggregated by income group. In addition to the decile breakdown, the top 1% and top 0.1% of the net worth distribution are separately reported.

Table 2.4 shows the joint distribution of net worth (including all pension entitlements) by income and net worth groups. In the rows the income groups of macro disposable income are presented. In the columns the wealth distribution is shown, where the total (in row 1) equals the totals of Table 2.1. The distribution of net worth by income is markedly less skewed than that by net worth group, although our choice not to equivalise income has slightly increased the observed skewness. Across the entire income distribution, average net worth remains positive in all deciles, with the overall average for the lowest income decile amounting to €331,000 per household. However, this figure varies substantially by net worth group, from €20,000 in the lowest wealth decile to €4.56 million in the highest.

A further examination reveals several notable patterns. Households that are both in the highest income, and the highest net worth decile hold 14.1% of total net worth. The table further details the top of the income and net worth distribution, showing that households that are both in the top 0.1% of both rankings hold 0.6% of total net worth. Remarkably, within the lowest decile of the net worth distribution, the highest income groups are the only groups that have negative net worth. This pattern occurs because in these groups – in particular the 10th decile - there are many self-employed entrepreneurs with high earnings but leveraged positions.

The distribution of households tends to concentrate along the negative diagonal of the joint decile matrix, indicating a strong alignment between income and net worth ranks. Approximately two-thirds of households fall within two deciles of each other across the income and wealth distributions, underscoring the degree of overlap between these two dimensions of economic well-being. The largest clusters are found in the extremes: 307,000 households in the lowest income and wealth decile (D1–D1) and 305,000 in the highest (D10–D10).

A noteworthy deviation from this pattern appears in the highest net worth decile, which includes 33,000 households from the lowest income decile —highlighting a group of asset-rich, income-poor households. While this group of households owns 2.5% of total net worth in the Netherlands, their classification stems largely from the presence of negative disposable income, which arises due to the accounting treatment of certain financial flows.

Specifically, many of these households are elderly and receive payouts from life insurance or annuity products. While these payments represent financial transactions and are thus excluded from disposable income in national accounts, the associated tax liabilities are recorded as income taxes. Consequently, the mismatch between taxable receipts and recorded income leads to negative disposable income values in the data. This phenomenon suggests a temporal misalignment in the measurement of economic well-being and highlights an area worthy of further research. These households are unlikely to remain in the lowest income decile in subsequent years, as their reported income and tax obligations are expected to realign, reflecting the inherently dynamic nature of income distribution. These patterns underscore the importance of examining income and wealth jointly to better capture the diverse profiles of economic well-being.

Savings Patterns Across the Income–Wealth Spectrum

While the joint distribution analysis provides a static view of the alignment between income and wealth, it also prompts deeper questions about the mechanisms driving wealth accumulation. One pathway is savings—typically defined in national accounts as disposable income minus consumption, plus compulsory net pension contributions. However, savings can also be inferred from changes in household net worth over time, which encompasses both active saving and passive capital gains. Based on Norwegian administrative data Fagereng *et al.* (2021) found that net saving rates, excluding capital gains, are approximately constant across the wealth distribution. However, when including capital gains, saving rates increase markedly with wealth, indicating that wealthier households accumulate wealth primarily through capital gains rather than higher saving rates. Similarly, Bauluz (2021) examined U.S. cohorts and observed that while saving was the primary component of wealth accumulation for earlier generations, capital gains have become increasingly significant for more recent cohorts.

In the System of National Accounts (SNA), gross savings is a balancing item that results from subtracting household final consumption from gross disposable income. To this, net savings in occupational pension schemes—comprising the difference between contributions and benefits—are added. In 2021, Dutch households recorded a gross disposable income of €439 billion[13], of which €355 billion was spent on consumption. This yielded total gross savings of approximately €110 billion, including €25 billion in net pension savings. These pension-related savings indicate that households, on aggregate, contributed more to pension schemes than they received in benefits. The resulting gross savings rate—calculated as gross savings over the sum of disposable income and net pension entitlements—stood at 23.6%. Excluding the compulsory savings component associated with pensions, this rate would have been notably lower, at 18.2%.

Our analysis reveals substantial variation in savings rates across the income and wealth distribution, as presented in Table 2.5.[14] In 2021, the savings rate was relatively high, primarily due to reduced consumption opportunities associated with the COVID-19 pandemic. However, we still observe negative savings rates among the lower half of the population when grouped by income, and similarly, among the bottom 20 percent when classified by net worth. While our findings on savings rates by net worth decile diverge significantly from those reported by Fagereng *et al.* (2021), our results by income decile align with the experimental estimates from the OECD Expert Group on Disparities in a National Accounts Framework (OECD, 2021). In countries like Australia and France, the savings rate for the second income quintile hovers around zero, becoming positive only for higher quintiles. In contrast, countries such as Mexico and the Czech Republic exhibit negative

[13] Just as wealth in the national accounts differs from microeconomic measures of wealth, the same applies to income. Several reasons explain the gap between these two perspectives. First, population coverage differs: microdata typically include individuals registered as residents on January 1st, whereas national accounts cover all persons resident in the country during the year. Second, conceptual boundaries of income diverge. National accounts include imputed components such as financial intermediation services indirectly measured (FISIM) and investment income earned by pension entitlements—items that are not included in microdata. Moreover, the national accounts incorporate estimates for income generated in the non-observed economy, while certain transfers, such as housing subsidies, are classified as social transfers in kind and excluded from disposable income in the macroeconomic framework. For a detailed discussion, see Bruil (2018; 2023).

[14] These savings rates are derived using the methodology of Bruil (2023), where savings are not directly observed but inferred as a residual—subtracting household consumption from disposable income. A critical input for this estimation is the Household Budget Survey (HBS), which, due to its limited sample size and infrequent data collection, is integrated into the dataset through aggregate-level imputation. As a consequence of these limitations, we refrain from reporting savings rates for the top 1% and above, as the estimates for these groups lack sufficient reliability.

savings rates even in the fourth quintile, indicating that up to 80 percent of the population may lack sufficient income to fully finance their consumption needs.

Table 2.5: Savings rate by income and net worth decile, 2021

		Net Worth decile										
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
Income decile	**1**	-168	-140	-124	-150	-229	-318	-443	-600	-1439	-315	-168
	2	-27	-47	-55	-54	-50	-52	-67	-92	-94	-36	-47
	3	3	-4	-18	-36	-43	-43	-42	-49	-71	-35	-23
	4	17	12	10	-4	-18	-31	-43	-46	-54	-49	-12
	5	26	21	20	15	9	-4	-23	-40	-54	-57	-5
	6	33	29	28	24	21	17	6	-17	-39	-58	4
	7	38	35	34	31	29	27	24	16	-11	-40	17
	8	42	40	38	36	35	35	33	31	23	-17	28
	9	46	45	44	42	40	40	40	39	37	23	37
	10	75	64	61	58	54	51	49	49	51	64	57
	Total	**0**	**-8**	**3**	**12**	**21**	**24**	**25**	**26**	**28**	**42**	

Note: This table presents estimated household savings rates by income and net worth groups. Income refers to non-equivalised disposable household income, while net worth is defined according to the SNA concept, which includes occupational pension entitlements, but excludes public pensions. The savings rate is calculated as gross savings divided by the sum of disposable income and net pension entitlements.

Across the net worth distribution, total savings rates are higher for all deciles when occupational pension savings are accounted for (Table 2.5 versus Table 2.6). However, the relative gain is smallest in the top net worth decile, where the rate increases only marginally from 41% to 42%. In contrast, households in the bottom net worth decile shift from a negative savings rate of –8% to approximately zero once pension savings are included. When viewed through the lens of income deciles, the picture becomes more complex. The inclusion of occupational pensions actually worsens the average savings rate for lower-income groups. This is primarily because these groups contain a higher proportion of retirees, who, as a collective, receive more in pension benefits than they contribute—leading to negative net pension savings. Analyzing the joint distribution of income and wealth reveals a similar dynamic: within each income group, households with greater wealth tend to include more retirees. Consequently, the savings rates for these wealthier segments within each income group—positioned above the negative diagonal—are reduced due to negative occupational pension savings.

Table 2.6: Savings rate (excluding pension savings) by income and net worth decile, 2021

		Net Worth decile										
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
Income decile	**1**	-162	-133	-118	-147	-223	-289	-396	-583	-2570	283	-213
	2	-30	-43	-41	-36	-36	-39	-44	-48	-54	-93	-39
	3	-4	-10	-13	-14	-16	-19	-23	-25	-28	-46	-14
	4	8	2	1	-2	-4	-9	-14	-16	-17	-23	-5
	5	17	12	10	5	2	0	-4	-8	-11	-13	0
	6	25	21	18	14	10	7	4	1	-2	-6	7
	7	29	27	25	21	19	16	13	10	6	3	14
	8	32	31	29	26	25	24	23	20	15	9	21
	9	37	37	35	32	31	31	30	29	26	22	28
	10	73	60	57	53	47	44	42	42	45	61	53
	Total	**-8**	**-15**	**-3**	**7**	**14**	**17**	**19**	**21**	**25**	**41**	

Note: This table presents estimated household savings rates by income and net worth groups. Income refers to non-equivalised disposable household income, while net worth is defined according to the SNA concept, which includes occupational pension entitlements, but excludes public pensions. The savings rate presented in this table excludes compulsory pension savings. It is calculated by subtracting household consumption from disposable income, with the resulting residual expressed as a percentage of disposable income.

The most dramatic disparity in savings rates relative to income is seen among households in the lowest income decile. However, when examining savings relative to net worth (Table 2.7), households that fall into both the lowest income decile and the ninth net worth decile dissave only 3% of their net worth. Unsurprisingly, the most troubling dynamics emerge in the lowest net worth decile, where all households, regardless of income, have negative net worth. Yet notably, for the top eight income deciles within this group, savings remain positive. A particularly striking finding is observed among households that fall into both the first or second income decile and the lowest net worth decile: their savings as a percentage of net worth appear positive, but only because both their savings and net worth are negative—an accounting anomaly. This subgroup comprises approximately 488,000 households. Focusing more closely on the D1-D1 group (those in both the lowest income and wealth deciles), we find a relatively young demographic, often single-person households. Compared to the general population, this group has a significantly lower rate of homeownership and has typically accumulated very little in pension entitlements.

Table 2.7: Savings as a percentage of net worth by income and net worth decile, 2021

		Net Worth decile										
		1	2	3	4	5	6	7	8	9	10	**Total**
Income decile	1	716%	-45%	-20%	-11%	-7%	-6%	-4%	-4%	-3%	-1%	-6%
	2	2836%	-25%	-13%	-6%	-4%	-2%	-2%	-2%	-1%	0%	-7%
	3	-51%	-3%	-6%	-5%	-3%	-2%	-2%	-1%	-1%	0%	-3%
	4	-80%	13%	5%	-1%	-2%	-2%	-2%	-2%	-1%	-1%	-1%
	5	-55%	28%	12%	4%	2%	0%	-1%	-2%	-1%	-1%	0%
	6	-54%	46%	20%	8%	4%	2%	1%	-1%	-1%	-1%	0%
	7	-45%	68%	29%	13%	7%	5%	3%	1%	0%	-1%	2%
	8	-29%	92%	40%	18%	11%	7%	5%	3%	2%	0%	3%
	9	-26%	126%	56%	26%	15%	10%	7%	5%	4%	1%	5%
	10	-31%	309%	125%	57%	29%	18%	12%	9%	7%	5%	7%
	Total	1%	-6%	1%	3%	4%	4%	3%	3%	2%	2%	

Note: This table presents estimated household savings expressed as a percentage of their net worth. Income refers to non-equivalised disposable household income, while net worth is defined according to the SNA concept, which includes occupational pension entitlements, but excludes public pensions.

2.4. Conclusion and Further Research

This study provides a detailed analysis of wealth inequality in the Netherlands, emphasizing the transformative effects of incorporating pension entitlements into net worth measurements. The findings reveal that the inclusion of pension entitlements, both occupational and public, significantly alters the landscape of wealth distribution. Specifically, public pensions play a crucial role in enhancing wealth for middle and lower-income households, while private pensions contribute more substantially to the mean net worth, benefiting higher-income groups.

Including pension entitlements in household net worth calculations substantially reduces measured inequality, as shown by a drop in the Gini coefficient from 0.664 (excluding pensions) to 0.521 (including all pensions). Decomposition analysis reveals that this equalizing effect is driven primarily by vertical redistribution, though some reranking occurs due to the age-linked distribution of pension rights. Moreover, the inclusion of pensions shifts wealth upward for the lower eight deciles and reduces top-end concentration, as reflected in a lower Palma index, demonstrating the significant redistributive role of pension wealth in shaping economic inequality. The effects on the bottom decile are particularly striking. Without pension entitlements, households in this group often display negative or minimal net worth. The inclusion of occupational pensions alone provides some improvement, but the addition of public pensions results in a significant shift, turning negative net worth shares into positive values.

The findings underscore that wealth inequality is deeply influenced by a variety of household factors. Across different definitions of net worth, homeownership status emerges as the most influential factor, though its importance declines when pension entitlements are included, giving greater explanatory power to age and household composition—reflecting life-cycle wealth accumulation. Regional differences play only a minor role. Homeowners show significantly higher net worth than renters, and older or retired households tend to have greater wealth, particularly due to pension entitlements. These findings highlight how housing and pensions are central to wealth accumulation, while geographic disparities remain limited.

Analyzing income and wealth in conjunction—rather than in isolation—yields richer insights into economic inequality in the Netherlands. While income inequality remains relatively modest by international standards, the stark disparities in wealth ownership complicate the narrative. The joint distribution approach reveals that although income and wealth are broadly aligned for the majority of households, significant mismatches persist—particularly among low-income, high-wealth retirees and high-income, low-wealth entrepreneurs. These groups highlight the importance of incorporating lifecycle dynamics and institutional features into inequality analyses.

Moreover, the integration of household savings behavior reveals that the Dutch pension system plays an important role in asset accumulation, especially for lower- and middle-income households. While compulsory pension savings elevate the national savings rate, a disaggregated view uncovers that nearly half the population saves little or nothing outside these mandatory systems. This finding challenges the perception of the Netherlands as a "nation of savers" and underscores the redistributive function of the pension system.

Future research could enhance this analysis by incorporating savings measures that distinguish active savings from capital gains, thereby deepening the understanding of the underlying mechanisms of wealth accumulation. Moreover, substituting current disposable income with a lifetime income measure could provide a more stable and conceptually aligned benchmark for comparison with wealth—mitigating distortions caused by temporary income fluctuations, including the presence of negative disposable incomes. Such an approach would offer a clearer picture of intertemporal economic well-being and the structural drivers of inequality.

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2.6. Appendix A Full Distributional Tables, 2016-2021

This appendix presents the full set of annual distributional tables underlying the results discussed in Section 2.3 of the main text. Each table follows the structure of Table 2.1, reporting key metrics such as total net worth, mean and median net worth, the incidence of negative net worth, Gini coefficients, wealth shares, and ratios across three net worth concepts: (1) the SNA baseline, (2) excluding all pension entitlements (lower bound), and (3) including both occupational and public pensions (upper bound). These tables allow for year-by-year comparisons and offer a detailed view of how pension entitlements affect the level and distribution of household wealth over time. For completeness, the 2021 table is reproduced here as well, though it is also included in the main body of the paper.

Table 2.8: Household Net Worth and Inequality Metrics Under Alternative Wealth Concepts (2016)

		Net worth according to SNA	Net worth according to SNA, excluding pension entitlements	Net worth according to SNA, including public pension entitlements
Descriptives				
Sum of Net Worth	bn euros	3001.7	1677.8	3987.2
Mean net worth per household	thousand euros	371.7	207.7	493.7
Median net worth per household	thousand euros	178.5	64.4	296.8
Number of households	thousands	8076038	8076038	8076038
Number of households with positieve net worth		7748033	7534632	7903618
Number of households with negative net worth		328005	541406	172420
Shares				
Decile 1 - lowest net worth group	share in total	-0.01	-0.031	-0.004
Decile 2		0.006	0.005	0.011
Decile 3		0.014	0.011	0.024
Decile 4		0.025	0.016	0.036
Decile 5		0.039	0.025	0.051
Decile 6		0.059	0.041	0.071
Decile 7		0.087	0.072	0.097
Decile 8		0.125	0.113	0.131
Decile 9		0.187	0.174	0.183
Decile 10 - highest net worth group		0.467	0.575	0.399
Top 1%		0.151	0.239	0.118
Top 0.1%		0.055	0.094	0.042
Ratios and indicators				
Q5 / Q1 ratio		-179.4	-27.8	73.4
D10 / D1 ratio		-46.9	-18.3	-113.6
Palma (10/40)		13.1	-5140.7	5.9
Gini		0.652	0.766	0.572

Table 2.9: Household Net Worth and Inequality Metrics Under Alternative Wealth Concepts (2017)

		Net worth according to SNA	Net worth according to SNA, excluding pension entitlements	Net worth according to SNA, including public pension entitlements
Descriptives				
Sum of Net Worth	bn euros	3248.6	1794.1	4252.6
Mean net worth per household	thousand euros	399.2	220.5	522.6
Median net worth per household	thousand euros	195.2	77.6	316.8
Number of households	thousands	8136955	8136955	8136955
Number of households with positieve net worth		7818002	7648356	7976194
Number of households with negative net worth		318953	488599	160761
Shares				
Decile 1 - lowest net worth group	share in total	-0.008	-0.026	-0.002
Decile 2		0.006	0.006	0.011
Decile 3		0.013	0.011	0.023
Decile 4		0.024	0.017	0.036
Decile 5		0.039	0.027	0.051
Decile 6		0.061	0.047	0.072
Decile 7		0.089	0.079	0.097
Decile 8		0.126	0.119	0.131
Decile 9		0.185	0.181	0.181
Decile 10 - highest net worth group		0.467	0.538	0.4
Top 1%		0.158	0.21	0.125
Top 0.1%		0.061	0.093	0.047
Ratios and indicators				
Q5 / Q1 ratio		-297.9	-36.3	67.6
D10 / D1 ratio		-59.6	-21.1	-171.2
Palma (10/40)		13.6	60.8	5.9
Gini		0.651	0.732	0.572

Table 2.10: Household Net Worth and Inequality Metrics Under Alternative Wealth Concepts (2018)

		Net worth according to SNA	Net worth according to SNA, excluding pension entitlements	Net worth according to SNA, including public pension entitlements
Descriptives				
Sum of Net Worth	bn euros	3369.8	1926.8	4363.4
Mean net worth per household	thousand euros	410.4	234.7	531.4
Median net worth per household	thousand euros	213.6	90.8	331.2
Number of households	thousands	8211108	8211108	8211108
Number of households with positieve net worth		7862978	7686095	8013467
Number of households with negative net worth		348130	525013	197641
Shares				
Decile 1 - lowest net worth group	share in total	-0.009	-0.029	-0.004
Decile 2		0.005	0.005	0.01
Decile 3		0.012	0.01	0.023
Decile 4		0.025	0.016	0.037
Decile 5		0.042	0.028	0.053
Decile 6		0.064	0.052	0.074
Decile 7		0.093	0.083	0.1
Decile 8		0.131	0.123	0.134
Decile 9		0.191	0.184	0.186
Decile 10 - highest net worth group		0.446	0.527	0.387
Top 1%		0.136	0.199	0.109
Top 0.1%		0.05	0.084	0.039
Ratios and indicators				
Q5 / Q1 ratio		-148.7	-29.1	84
D10 / D1 ratio		-47.9	-18.1	-105.2
Palma (10/40)		13.6	315.6	5.8
Gini		0.64	0.733	0.566

Table 2.11: Household Net Worth and Inequality Metrics Under Alternative Wealth Concepts (2019)

		Net worth according to SNA	Net worth according to SNA, excluding pension entitlements	Net worth according to SNA, including public pension entitlements
Descriptives				
Sum of Net Worth	bn euros	3573	2093.2	4584.7
Mean net worth per household	thousand euros	431.1	252.6	553.2
Median net worth per household	thousand euros	232.8	109.2	350.2
Number of households	thousands	8287798	8287798	8287798
Number of households with positieve net worth		7988953	7841818	8120529
Number of households with negative net worth		298845	445980	167269
Shares				
Decile 1 - lowest net worth group	share in total	-0.007	-0.022	-0.003
Decile 2		0.005	0.005	0.011
Decile 3		0.013	0.01	0.024
Decile 4		0.026	0.016	0.037
Decile 5		0.044	0.031	0.054
Decile 6		0.066	0.057	0.075
Decile 7		0.095	0.088	0.101
Decile 8		0.133	0.126	0.135
Decile 9		0.191	0.185	0.186
Decile 10 - highest net worth group		0.436	0.504	0.381
Top 1%		0.129	0.185	0.105
Top 0.1%		0.046	0.075	0.036
Ratios and indicators				
Q5 / Q1 ratio		-299	-40.9	68.9
D10 / D1 ratio		-59.8	-23	-146.8
Palma (10/40)		12.1	53	5.5
Gini		0.629	0.706	0.558

Table 2.12: Household Net Worth and Inequality Metrics Under Alternative Wealth Concepts (2020)

		Net worth according to SNA	**Net worth according to SNA, excluding pension entitlements**	**Net worth according to SNA, including public pension entitlements**
Descriptives				
Sum of Net Worth	bn euros	4014	2303.4	5455.9
Mean net worth per household	thousand euros	481	276	653.8
Median net worth per household	thousand euros	269.2	127.2	438.6
Number of households	thousands	8344630	8344630	8344630
Number of households with positieve net worth		8074207	7926255	8271565
Number of households with negative net worth		270423	418375	73065
Shares				
Decile 1 - lowest net worth group	share in total	-0.005	-0.016	0.001
Decile 2		0.006	0.006	0.015
Decile 3		0.013	0.011	0.027
Decile 4		0.027	0.017	0.041
Decile 5		0.045	0.033	0.057
Decile 6		0.068	0.06	0.078
Decile 7		0.097	0.092	0.104
Decile 8		0.135	0.129	0.136
Decile 9		0.193	0.188	0.184
Decile 10 - highest net worth group		0.421	0.481	0.357
Top 1%		0.114	0.159	0.089
Top 0.1%		0.036	0.057	0.027
Ratios and indicators				
Q5 / Q1 ratio		910.4	-61.3	33.8
D10 / D1 ratio		-86.3	-29.3	265.4
Palma (10/40)		10.4	28.8	4.2
Gini		0.615	0.682	0.526

Table 2.13: Household Net Worth and Inequality Metrics Under Alternative Wealth Concepts (2021)

		SNA	SNA, excluding pension entitlements	SNA, including public pension entitlements
Descriptives				
Sum of Net Worth	bn euros	4446.2	2540.1	5946.1
Mean net worth per household	thousand euros	528.6	302	707
Median net worth per household	thousand euros	308.4	149.9	481.8
Number of households	thousands	8410706	8410706	8410706
Number of households with positieve net worth		8197640	8061805	8356477
Number of households with negative net worth		213066	348901	54229
Shares				
Decile 1 - lowest net worth group	share in total	-0.003	-0.012	0.002
Decile 2		0.006	0.006	0.015
Decile 3		0.014	0.011	0.028
Decile 4		0.027	0.017	0.041
Decile 5		0.047	0.036	0.058
Decile 6		0.071	0.064	0.079
Decile 7		0.099	0.094	0.105
Decile 8		0.136	0.131	0.137
Decile 9		0.191	0.186	0.183
Decile 10 - highest net worth group		0.412	0.467	0.352
Top 1%		0.112	0.153	0.088
Top 0.1%		0.034	0.054	0.026
Ratios and indicators				
Q5 / Q1 ratio		219.7	-106.4	31.2
D10 / D1 ratio		-129.5	-38.7	160.9
Palma (10/40)		9.4	21	4.1
Gini		0.604	0.664	0.521

2.7. Appendix B Dominance Analysis, 2016-2021

This appendix presents the results of the dominance analysis conducted for each year between 2016 and 2021, across three net worth concepts: the System of National Accounts (SNA) baseline, the lower bound (excluding pension entitlements), and the upper bound (including both occupational and public pensions). The analysis quantifies the relative importance of key demographic and socioeconomic factors—namely, age of the household head, region, household composition, and homeownership status—in explaining variation in net worth. These results provide insight into the changing structure of wealth inequality over time and clarify how the inclusion of pension entitlements alters the explanatory power of these variables. While homeownership consistently dominates, the relative contribution of age and household composition increases with the incorporation of pension wealth, reflecting the life-cycle nature of pension accumulation. Regional differences, by contrast, remain negligible throughout the period.

Table 2.14: Dominance Analysis by Net Worth concept, 2016

	SNA	SNA, excluding pension entitlements	SNA, including public pension entitlements
Age of the head of the household	21%	15%	26%
Region	1%	1%	1%
Household composition	33%	28%	40%
Homeownership status	45%	56%	34%
	100%	100%	100%

Table 2.15: Dominance Analysis by Net Worth concept, 2017

	SNA	SNA, excluding pension entitlements	SNA, including public pension entitlements
Age of the head of the household	19%	14%	24%
Region	2%	3%	1%
Household composition	29%	25%	36%
Homeownership status	50%	59%	39%
	100%	100%	100%

Table 2.16: Dominance Analysis by Net Worth concept, 2018

	SNA	SNA, excluding pension entitlements	SNA, including public pension entitlements
Age of the head of the household	18%	12%	23%
Region	2%	3%	1%
Household composition	28%	24%	34%
Homeownership status	53%	62%	42%
	100%	100%	100%

Table 2.17: Dominance Analysis by Net Worth concept, 2019

	SNA	SNA, excluding pension entitlements	SNA, including public pension entitlements
Age of the head of the household	16%	10%	22%
Region	2%	3%	1%
Household composition	27%	23%	33%
Homeownership status	55%	64%	44%
	100%	100%	100%

Table 2.18: Dominance Analysis by Net Worth concept, 2020

	SNA	SNA, excluding pension entitlements	SNA, including public pension entitlements
Age of the head of the household	16%	10%	21%
Region	2%	3%	1%
Household composition	27%	22%	34%
Homeownership status	55%	65%	44%
	100%	100%	100%

Table 2.19: Dominance Analysis by Net Worth concept, 2021

	SNA	SNA, excluding pension entitlements	SNA, including public pension entitlements
Age of the head of the household	15%	9%	19%
Region	2%	3%	1%
Household composition	27%	22%	34%
Homeownership status	56%	66%	46%
	100%	100%	100%

Chapter 3

3. Inequality and Redistribution in the Netherlands

This chapter is based on Bruil, A., Van Essen, C., Leenders, W., Lejour, A., Möhlmann, J., & Rabaté, S. (2022). Inequality and Redistribution in the Netherlands.

3.1. Introduction

The level of inequality in economic resources is a defining characteristic of human societies. This level varies greatly over time, with egalitarian hunter-gatherer groups having been replaced by more unequal agricultural, industrial and, ultimately, post-industrial societies, and across countries.[15] Today, inequality, as measured by the share of pre-tax income earned by the 10% of highest incomes, ranges from close to 70% in South Africa to just over 30% in France (Chancel *et al.*, 2022). In each society, collective institutions such as the government shape how income is (re)distributed, often with the explicit goal of limiting inequality (Saez, 2021).[16] The questions of who pay the taxes and who benefit from government spending are among the most important in democratic societies.

This paper studies income inequality in the Netherlands, before and after redistribution through taxation and government spending. Following the growing literature on *Distributional National Accounts* pioneered by Piketty, Saez and Zucman (2018) and Garbinti, Goupille-Lebret and Piketty (2018), our inequality statistics are consistent with macroeconomic income concepts used by national statistics offices.[17] We are able to provide an exceptionally detailed picture of inequality and redistribution through a wide array of detailed administrative datasets covering the full Dutch adult population. Through access to a ownership registry, we can study the incomes and tax burdens of the (super)rich in a manner not previously possible. Precise data on the receipt of in-kind transfers allow us to study the redistributive impact of this largely unexplored component of government spending. Throughout our analysis, we demonstrate the importance of assumptions for the

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[15] In hunter-gatherer societies inequality is contained by the limited accumulation and inheritance of property (Borgerhoff Mulder et al., 2009). As material wealth became more easily transmissible in agricultural societies levels of inequality rose to levels not unlike those in modern times (Kohler and Smith, 2018).

[16] Aversion to inequality is not uniquely human. Biologists first documented this trait among capuchin monkeys and have since found it in other monkeys, apes as well as dogs and birds (Brosnan and De Waal, 2003, 2014).

[17] The OECD’s Expert Group on Disparities in a National Accounts Framework (EGDNA) has also worked on providing a distributional dimension to macroeconomic statistics, but restricted its focus to the household sector, thereby ignoring the portion of profits not distributed but instead retained within corporations (Fesseau and Mattonetti, 2013; Zwijnenburg et al., 2021).

wider inequality literature and try to quantify the level of uncertainty involved in our own statistics.

For the economists responsible for the earliest versions of modern national accounts, the study of inequality was an indispensable component of those accounts (Tarasov and Colm, 1941; Kuznets and Jenks, 1953). More recently, the Stiglitz-Sen-Fitoussi commission (2009) has advocated to give more prominence to the distribution of income, consumption and wealth in the measurement of economic performance and social progress. While average and aggregate values contain important information, they cannot shed light on topics such as the evolution of poverty, top incomes, and, more generally, the economic well-being of different socio-economic groups. In macroeconomics, recent work has demonstrated that explicitly incorporating the distribution of income and wealth can enhance our understanding of the transmission of monetary and fiscal policy (Ahn *et al.*, 2018; Kaplan, Moll and Violante, 2018). By aligning the study of inequality with the national accounts, our inequality statistics are based on an income concept that is consistent and comparable over time and across countries.

We improve on existing studies of inequality and redistribution in the Netherlands which only consider income earned and taxes paid directly by households (e.g., Caminada *et al.* (2021), Olsthoorn *et al.* (2017), Salverda (2019) and Bruil (2023)). There have been two notable attempts to construct distributional national accounts for the Netherlands by Blanchet, Chancel and Gethin (2022) and Ederer *et al.* (2022), but both studies rely mostly on survey data and tax tabulations instead of administrative data, limiting their ability to study the top. The granularity of our data allows us to do exactly that and we find that these studies overstate the progressivity of taxes for the bottom 99% and understate the fall in the tax burden for the top 1%.

Our analysis yields four main sets of results. First, we show that the Netherlands has a level of inequality typical of western European countries, with a top 10% share of pre-tax income of 35% slightly above France and Austria and similar to Germany. The top 10% differs markedly from other groups in terms of their source of income, and the top 1% even more so. Whereas most of the bottom 90%'s income consists of labour and pension income, retained earnings, the difference between profits and dividends, dominate the incomes at the top. Studies that ignore earnings retained within firms miss the predominant form of income of the rich, an issue that has previously been documented by a number of studies using corporate registries to assign retained earnings to individuals in Norway, Chile and Canada (Alstadsæter *et al.*, 2016; Fairfield and Jorratt De Luis, 2016; Wolfson *et al.*, 2016). Furthermore, as highlighted by Kopczuk and Zwick (2020), the decision whether or not to distribute profits depends on the precise design of the taxation of corporate and personal income. This means that the inequality statistics that leave out retained earnings are not robust to changes in tax rates and rules. By including retained earnings in our measure of income, we avoid this issue.

In the Netherlands, we can use a corporate ownership registry to link shareholders to closelyheld businesses, even in cases of complex ownership structures. This registry enables us to evaluate conventional methods used to assign retained earnings to individuals, such as assigning them proportional to equity wealth or dividends. We find that these methods approximate the true level of inequality well but suffer from several biases that lead to an underestimation of top income shares. An important problem with these methods is that they cannot account for the prevalence of negative retained earnings because equity wealth and dividends are necessarily positive. This leads to an underestimation of inequality for two reasons. Firstly, these methods cap the distribution of retained earnings at zero. Secondly, these methods assign the national accounts aggregate for retained earnings (let us call this amount "*A*") to all equity owners or dividend recipients, while we would really want to assign the total of positive retained earnings ("*B*", where $B > A$) to the shareholders of firms with positive retained earnings (group B), and the total of negative retained earnings ("*C*", where $C < 0$) to the shareholders of firms with negative retained earnings (group C). In general, this leads to an understatement of top income shares.[18] We also use the ownership registry to

[18] This can be illustrated by the extreme case where half of businesses have positive retained earnings, and half have negative retained earnings such that they exactly sum to zero on aggregate. In this case, the shareholders of firms with positive retained earnings would be assigned zero retained earnings, as would the shareholders of firms with negative retained earnings, and there would be no inequality in retained earnings.

show the importance of retained earnings for return heterogeneity, as studied by Fagereng *et al.* (2020) and Bach, Calvet and Sodini (2020).

Second, we find that the tax rate is roughly flat – around 45% – for the bottom 90% and collapses to less than half of this level for the very top. Relying on the ownership registry and other administrative datasets, we are able to compute the first exact estimate of the tax rate of the super rich for a single country, considering taxes levied at the personal and corporate level, as well as indirect taxes.[19] Combining our result with studies from Italy, France and the United States we establish that the level of tax progressivity is ultimately determined by the interplay of (regressive) consumption and payroll taxes and (progressive) corporate and personal income taxes. At the very top, personal income taxes make up a near zero share of total income such that the tax burden is almost entirely determined by the corporate income tax. This finding is in line with Bach *et al.* (2023) who find that the personal income tax largely fails to raise revenue from the very wealthy in France and that the corporate tax only partially makes up for this. We can use the ownership registry to link corporations to individuals and obtain an exceptionally precise picture of both income and taxation at the very top. We show that the methods to assign corporate taxes to individuals used in previous studies, Saez and Zucman (2019) for the United States, Bozio *et al.* (2024) for France and Guzzardi *et al.* (2024) for Italy, overstate the effective tax rate of the top 1%.

These results relate to the literature on the taxation of the (super)rich as reviewed by Scheuer and Slemrod (2020) and Güçeri and Slemrod (2023). This group is distinct in that most of their income is tied to their ownership of businesses and can take different forms, each with their own distinct tax consequences: wages, dividends, capital gains or retained earnings. Shareholders may instruct their companies to refrain from paying out dividends in order to avoid personal income taxes. Even if businesses pay out dividends, the personal income tax may be avoided through ownership structures containing one or multiple holding companies. The United States applies a surtax on the retained earnings of personal holding

[19] While Saez and Zucman (2019) estimate the tax burden of US billionaires, it depends largely on publicly available datasets and should be considered a rough approximation that could be improved through the use of administrative tax data.

companies, but most European countries do not. Furthermore, complex ownership chains are actively discouraged in the United States through the taxation of intercorporate dividends, while such taxes are prohibited in the European Union because of the Parent Subsidiary Directive (Morck, 2005). These institutional differences may help explain why we find that the European (super)rich pay effectively no personal income taxes, while those in the United States do.

Third, we investigate redistribution through government spending. Using precise data on both cash and in-kind transfers, we show that these are highest for the lowest income groups.[20]

Government spending is responsible for effectively all of the reduction in inequality: the bottom 50%'s (top 10%'s) share of income increases (falls) from 21.5% (35.3%) before to 24.4% (32.9%) after taxes and government spending. In-kind transfers often constitute the largest type of government spending, but few studies have been able to use precise data on the receipt of transfers related to health care and education and have instead had to rely on crude assumptions. We provide the most detailed evidence on the redistributive effect of in-kind transfers to date and show that while in-kind transfers reduce inequality, this reduction is muted by the fact that some recipients of in-kind transfers move into income groups higher up in the distribution as a result of those transfers.

The detailed nature of our data allows us to investigate the biases in conventional methods to assign in-kind transfers to individuals, such as assuming that in-kind transfers are distributed equally, as in Jestl and List (2022), or partly in proportion to income, as in Blanchet, Chancel and Gethin (2022). Most recently, researchers have used distributional incidence profiles from external sources to assign an average amount of in-kind transfers to each pre-tax income group, as in André, Germain and Sicsic (2023) and Gethin (2023*a*). On the one hand, the lump-sum method understates redistribution because on average, low-income individuals receive higher in kind transfers than high-income individuals. On the other hand, this method ignores variation in the amount of transfers received conditional

[20] These results are in line with those of a government report which looked at the incidence of government spending in 2014 (Olsthoorn et al., 2017).

on income, and thereby overstates the degree of redistribution. Empirically, the latter bias dominates. The method that uses distributional incidence profiles suffers from the second but not the first bias and as a result overstates the extent of redistribution more so than any of the other methods. The method that assigns some transfers lump-sum and others in proportion to income ultimately yields the estimate of redistribution closest to that based on microdata. However, it does so for the wrong reasons: by incorrectly assuming that individuals with high disposable incomes receive the highest in-kind transfers, it makes up for ignoring the variation of in-kind transfers within income groups.

Finally, we link our data to socio-demographic variables to consider inequality and redistribution across dimensions other than income, such as age, gender and location of residence. We improve upon existing statistics of spatial inequality as reported by the OECD 2022 and the *Linking National and Regional Inequality* project (Bauluz *et al.*, 2023) by considering a comprehensive income concept that includes both labour and capital income, as well as retained earnings, and find that regional inequalities are left largely intact by redistribution. For gender, we go beyond a lot of the recent literature that has focused on pre-tax labour earnings (see e.g., Blau and Kahn (2017) or Kleven *et al.* (2024)) and show that the totality of government redistribution reduces gender inequality by more than 25%. The reduction is primarily results from the fact that women earn lower incomes than men, rather than from facing lower tax rates or receiving higher amounts of government spending conditional on income. Redistribution between age groups is mostly relevant for those above the age of 50, while younger age groups pay in taxes almost as much as they receive in spending.[21]

This chapter is organised as follows. Section 3.2 describes the main institutional features of the Dutch system of taxation and government spending. We discuss our methodological framework and data sources used in Section 3.3. Section 3.4 presents the results on the distribution of pre-tax income, while Section 3.5 does so for redistribution and post-tax income. Section 3.6 concludes.

[21] As we will explain in Section 3.3, this comparison excludes redistribution that occurs through the pension system.

3.2. Institutional Background

The Netherlands is a high income, high tax country with an extensive welfare state. In 2016, national income was equal to 592 billion euros, around 44,000 euros per adult on average. Tax revenue amounted to just below 45% of national income. Tax collection is highly centralised with local taxes representing less than 2% of national income. Taxes can be decomposed into income taxes (16%), indirect taxes (12%), payroll taxes and mandatory health insurance premiums (13%), the corporate tax (3%) and the inheritance tax (0.3%).

The Dutch income tax treats labour and capital income differently.[22] Labour income is taxed according to a progressive schedule with a 52% top rate. The taxation of (income from) capital differs for large shareholdings (at least 5% of a company) and all other forms of wealth (excluding owner-occupied housing and pension wealth). In the former case, capital income (dividends and realised capital gains) is taxed at a 25% rate. In the latter case, a 1.2% tax is levied on the stock of net wealth with no further taxation of the income derived from this wealth. Before being distributed as dividends or retained within the firm, profits are taxed by the corporate tax which has a piecewise linear schedule, with a 20% marginal tax rate on the first 200,000 euros of profits and 25% on profits in excess of that. Profits related to research and development are taxed at a reduced rate of 5%.[23]

The largest indirect tax is the Value Added Tax (VAT), which has a 21% standard rate and a 6% reduced rate.[24] Excise taxes are levied on the purchase of gasoline and diesel, tobacco and alcohol. Other important indirect taxes relate to the ownership of cars, the use of energy, insurance, and the sale of real estate. Payroll taxes consist of contributions related to health care and long-term care, for unemployment and disability insurance, as well as for sickness benefits. In addition, basic health insurance is mandatory and paid for through

[22] The full text of the Income Tax Act of 2001, effective on January 1, 2016, is available at https://wetten.overheid.nl/BWBR0011353/2016-01-01.

[23] The full text of the Corporate Tax Act of 1969, effective on January 1, 2016, is available at https://wetten.overheid.nl/BWBR0002672/2016-01-01.

[24] The full text of the Value Added Tax Act of 1968, effective on January 1, 2016, is available at https://wetten.overheid.nl/BWBR0002629/2016-01-01.

premiums which are unrelated to income.[25] Finally, gifts and inheritances are taxed according to a progressive schedule, with rates depending on the relationship to the deceased person and with substantial exemptions for the transfer of closely-held businesses.

Government spending reached 43% of national income in 2016 and can be decomposed into in-kind transfers (20%), cash transfers (13%) and collective expenditure (10%). In-kind transfers take the form of health care and long-term care (10%), education (5%), and “other in-kind transfers” (5%). This latter category consists mostly of transfers related to child care, youth care and rental costs. The category cash transfers are almost fully made up of either transfers paid by social security funds (9%) or social assistance (4%). Finally, collective expenditure is mostly made up of costs related to economic affairs (3%), public order and safety (2%), general public services (2%), defence (1%), and environmental protection (1%). We provide a more detailed overview of taxes and forms of government spending in Section 3.9 Appendix B and Tables A.3-A.7 in Section 3.8 Appendix A.

In addition to government-provided pay-as-you-go pensions, the Netherlands has a large funded, semi-private pension system with compulsory, tax-deductible contributions. According to the National Accounts, pension funds owned financial assets worth 232% of national income at the end of 2016. The investment income associated with collective pension funds is the largest in the European Union, even in absolute amounts. As a result, through their pension entitlements even individuals at the bottom of the income distribution earn capital income.

The Netherlands records unusually large stocks of inward and outward foreign investment, a result of its role as a conduit country for multinational corporations (Lejour, 2021; Weyzig, 2013). Tørsløv, Wier and Zucman (2023) estimate that 32% of Dutch corporate tax receipts stem from multinational profit shifting. This is why we carefully distinguish between retained earnings that accrue to foreign and Dutch shareholders, as well as between corporate taxes

[25] To support households on low incomes, there exists a means-tested cash benefit that is nominally related to health insurance.

that are ultimately paid by foreign and Dutch shareholders. An extensive explanation of how we do so can be found in Section 3.11 Appendix D.1.

3.3. Methodology and Data

3.3.1. Conceptual Framework

Throughout our analysis we follow the World Inequality Lab's Distributional National Accounts (DINA) guidelines as closely as possible (Blanchet *et al.*, 2021). These guidelines provide a coherent framework to analyse the distribution of income and allow for a meaningful comparison of inequality across countries and over time. The ultimate objective of distributional national accounts is to construct inequality statistics that cover all of national income in a manner consistent with macroeconomic aggregates published by statistical offices around the world. An important improvement over traditional inequality estimates is the inclusion of profits retained within firms. Because of this, shareholders of profitable corporations are considered to have incomes proportional to their share in these corporations' profits, even if they refrain from paying out dividends. In measuring redistribution, we consider all taxes, both direct and indirect, at both the individual and corporate level, and all government spending, whether they take the form of cash transfers, in-kind transfers or collective expenditure. This way, we avoid the sometimes arbitrary and blurry distinction between different types of taxation and government spending that often complicates international comparisons.

In our main analysis, we study inequality and redistribution at the level of individual adults, where "adults" refers to individuals above the age of 20. In line with the literature, we apply the equal-split approach, where all of income, taxes and government spending is shared equally between adult members of the household.

We distinguish three main income concepts, outlined in Table 3.1. The first, pre-tax factor income, is equal to net national income and corresponds to the sum of income flows accruing to the factors of production before redistribution through social insurance, taxes and government spending. Under this definition, the income of many retirees and the unemployed will be close to zero and the degree of a country's inequality and redistribution will be largely driven by its age structure and unemployment rate. For this reason, we prefer the second income concept, pretax national income, even if its important drawback is that it ignores the redistributive nature of social insurance. To compute this concept, we subtract social insurance contributions from income and add social insurance benefits. The difference between contributions and benefits, the social insurance surplus or deficit, is distributed proportionally to pre-tax factor income, as recommended by the Distributional National Accounts (DINA) guidelines so as not to affect the distribution of income. The final income concept, post-tax national income, is that which results after the payment of taxes and receipt of government spending. The guidelines recommend to distribute the resulting government deficit or surplus in proportion to pre-tax factor income, which is what we do. This final concept allows us to measure government redistribution and decompose it into effects of the progressivity of taxation and government spending respectively.

All income concepts include earnings retained within corporations, an important form of income and savings at the top of the income distribution. In many countries, there are strong incentives to save income within corporations rather than paying it out in the form of dividends. Because we include retained earnings in our income concept, our results are not affected by changes to those incentives across time and across countries.

In our analysis, we are able to rely on a large number of administrative datasets that we discuss next. These datasets cover the full Dutch population and allow us to relax as well as test many of the assumptions typically required for the study of redistribution. For example, using a newly created registry on the ownership of closely-held businesses, we obtain a more accurate picture of the distribution of profits and corporate taxes. Similarly, for most in-kind transfers we observe the actual recipients of these transfers as well as the transfer amounts received. This allows us to uncover considerable amounts of heterogeneity in the amount of government support received by individuals, even conditional on demographic or income group.

Table 3.1: From pre-tax factor income to post-tax national income

Income concept	Macro total (% of national income)	Macro total (million euros)
Pre-tax factor income	100	591.574
Pre-tax factor income, households	74	435.911
Pre-tax factor income, gross, households	78	462.351
Consumption of fixed capital, households	4	26.439
Pre-tax factor income, corporate sector	14	81.917
Pre-tax factor income, government	12	73.689
Pre-tax factor income, non-profit institutions serving households	0	56
Net social contributions	20	119.015
Social security and insurance benefits	18	104.141
Social insurance surplus	3	14.874
Pre-tax national income	100	591.574
Taxes, excluding social insurance contributions	35	207.742
Cash transfers	4	20.891
Disposable income	68	404.723
In-kind transfers, health	10	56.749
In-kind transfers, non-health	10	60.468
Collective expenditure	10	57.624
Government surplus	3	17.064
Taxes paid by foreigners, net	1	5.056
Post-tax national income	101	596.63

NOTE: This table shows the total amount in euros for different income concepts in 2016. We provide additional detail in tables A.1, A.2, A.3, A.4, A.5, A.6 and A.7.

3.3.2. Data Sources

Microdata We build on and refine the work by Bruil (2023) who constructed distributional national accounts for the household sector in the Netherlands. We make use of a large number of administrative datasets, all maintained by Statistics Netherlands. Most of these datasets cover the full Dutch population and can be linked through a unique individual identifier, maintained by Statistics Netherlands and in most cases based on a person's social security number. More precisely, the datasets cover every individual registered in the population registry. This also includes homeless individuals, except when they overlap with the population of undocumented immigrants, whom our study does not cover. Datasets that are available at the household level can be linked to individuals through a file that links household identifiers to individual identifiers. In order to fully exploit the depth of the available datasets, our analysis focuses on a single year, 2016, leaving the construction of a time series for future research. While focusing on a single year naturally carries certain risks, we still believe in the broad representativeness of our results. The year 2016 was characterised by a remarkably stable macroeconomic environment. Real economic growth was positive and inflation was very close to zero. The tax and spending shares were both slowly increasing in the years around 2016.

Municipal registers provide information on basic demographic variables (date of birth, gender) as well as household composition and location of residence. Wages and social insurance contributions are taken from linked employer-employee data. Tax data, data on the receipt of cash transfers and data received from financial institutions on interest and dividends further complement the income data.

Our data on wealth rely on a number of administrative datasets such as the cadastral registry, information from pension funds on pension entitlements, tax data, information from financial institutions and an ownership registry for closely-held firms. We can link these datasets to information on income through the individual and household identifiers.

This ownership registry covers all Dutch shareholders who own at least 5% of a company's shares. This registry was constructed by Statistics Netherlands, combining data from the Dutch Tax Authority and the Chamber of Commerce. Ownership structures vary. In cases of direct ownership, the firm's shareholder is a natural person, who often serves as the firm's director. In many cases, however, firms are indirectly owned, through holding firms and subsidiaries. The registry captures all of these links. We observe balance sheets and income statements of all firms, derived from their tax returns. This allows us to trace (retained) profit and taxes paid at the corporate level back to the individual shareholders, even through multiple layers of ownership. One important limitation is that the registry only covers firms registered in the Netherlands. While we do observe dividends received from foreign firms, we cannot capture their retained earnings. Additionally, shareholdings below 5% are not covered by the ownership registry. While we are therefore not able to link these shares to specific companies, we do observe their value and dividends in the tax data. We discuss how this affects our estimates in Section 3.4.2.

For all important cash and in-kind transfers, we observe the receipt of transfers, either in monetary terms or in terms of real consumption. For transfers that are paid out in cash we observe the precise amount received by each household. For education, we observe the type as well as the number of enrolled months.[26] For health care, we directly observe individuals' expenditure covered by mandatory basic health insurance. For long-term care, youth care and social support services we observe the type, intensity and duration of care for each Dutch resident. When we observe measures of consumption, we combine these with detailed aggregate cost data in order to assign a monetary value of transfers to individuals.

Finally, we use a detailed budget survey to estimate the distribution of indirect taxes. A more detailed description of the datasets can be found in Section 3.10 Appendix C.

Macroeconomic aggregates The national accounts are constructed and made publicly available by Statistics Netherlands following the European System of National Accounts (Eurostat, 2013). The Dutch national accounts are unusually detailed and are consistently ranked as some of the most complete in the European Union (Eurostat, 2021, 2022). In addition to the publicly available national accounts, we have access to disaggregated tables, for example on the total expenditures for around 50 sub-categories of in-kind transfers. Finally, for earnings on foreign portfolio investment we rely on estimates produced by the Dutch central bank.[27]

In general, we scale variables in the microdata proportionally to match the relevant national account aggregates. To the extent that the discrepancy between the microdata and the national accounts is due to tax evasion, this practice implicitly assumes that different income groups engage in evasion to the same extent. While Leenders *et al.* (2023) show that evasion is instead concentrated among the top 10% wealthiest households, Alstadsæter, Johannesen and Zucman (2018) estimate that the stock of offshore wealth belonging to Dutch households is only 6% of GDP, which means that the associated income amounts to

[26] In effect, we assume that within education types, the only variation in receipt of education spending comes from the number of months spent at an educational institution. While there exist programs to support schools with a higher proportion of disadvantaged students, these programs are quantitatively small and public funding for education is primarily based on the number of students at an educational institution. Most educational institutions are privately run, but publicly funded. The share of students enrolled in privately-run, privately-funded educational institutions is far below the OECD average for upper secondary education, and near-zero for primary and lower secondary education (OECD, 2024).

[27] These estimates are part of an internal update of a report on the Dutch current account (De Nederlandsche Bank, 2013).

considerably less than 1%. Thus, accounting for the skewed nature of offshore tax evasion would hardly affect our results.

3.4. Inequality of Pre-tax Income

3.4.1. Pre-tax Factor and National Income

In this section, we describe our main results regarding the inequality of pre-tax income. Our analysis starts by considering pre-tax factor income, which corresponds to the incomes earned by factors of production before any form of redistribution through social insurance, taxation and government spending takes place. This income concept is composed of labour income, capital income earned by households, earnings retained by corporations, imputed rent and mixed income. Note that some forms of income, such as capital income and retained earnings, can be negative. The more than 13 million adults living in the Netherlands in 2016 earn an average pre-tax factor income of 44,371 euros, but this masks a substantial degree of inequality which we show in Table 3.2. As discussed in Section 3.3.1, individuals who depend on pension benefits or unemployment insurance earn near-zero amounts of pre-tax factor income, explaining the average income of only 12,352 euros for the bottom 50% of adults. The bottom 50% income share is only 13.9% while that of the top 10% is 37.9% leaving 48.2% for the middle 40% (P50-P90).

Table 3.2: The distribution of pre and post-tax income in 2016

		pre-tax factor income			pre-tax national income			post-tax national income		
Income group	Number of adults	Income threshold (€)	Average income (€)	Income share	Income threshold (€)	Average income (€)	Income share	Income threshold (€)	Average income (€)	Income share
Full population	13,332,368		44,371	100		44,371	100		44,747	100
Bottom 50%	6,666,184		12,351	13.9		19,049	21.5		21,811	24.4
Middle 40%	5,332,947	33,466	53,467	48.2	34,158	47,982	43.3	34,900	47,772	42.7
Top 10%	1,333,237	84,222	168,083	37.9	72,164	156,533	35.3	70,234	147,326	32.9
Top 1%	133,324	235,145	623,221	14	226,162	625,482	14.1	205,568	585,255	13.1
Top 0.1%	13,333	1,009,671	2,641,124	6	1,023,879	2,694,670	6.1	955,512	2,569,045	5.7
Top 0.01%	1,334	4,271,129	10,668,753	2.4	4,372,218	10,921,054	2.5	4,160,823	10,549,048	2.4
Top 0.001%	134	18,392,004	39,637,419	0.9	18,828,918	40,602,767	0.9	18,511,744	39,469,992	0.9
Top 0.0001%	14	87,588,156	108,857,900	0.3	89,761,129	111,562,388	0.3	90,844,172	110,687,676	0.3

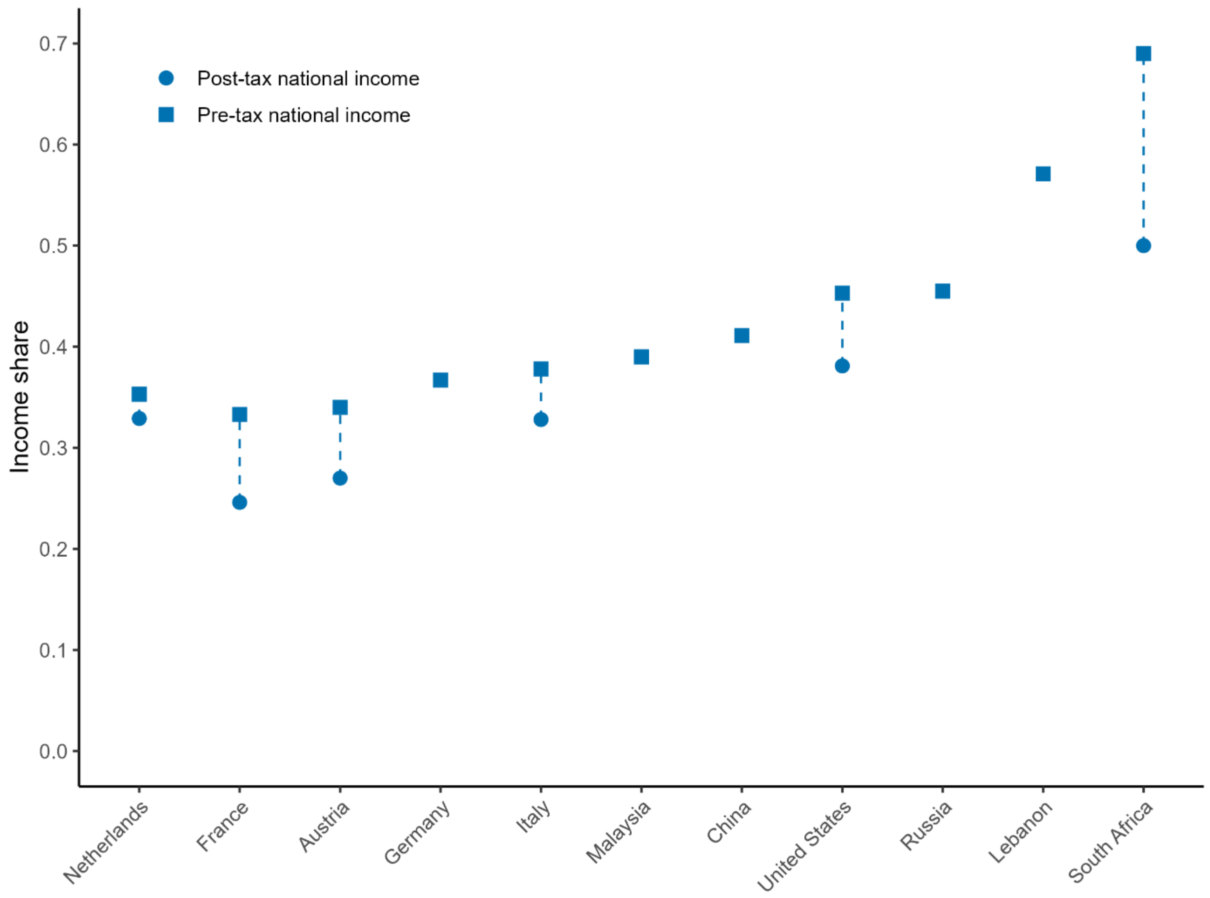
Note: This table presents statistics on the distribution of pre-tax factor income, pre-tax national income and post-tax national income in the Netherlands in 2016. The unit of analysis is the adult (20+ years old) and income is split among all adult members of a household equally. Income groups are defined in terms of all adults in the population. Adults are ranked according to the income concept that is studied such that they may belong to different income groups depending on the concept of income.

In order to go from pre-tax factor income to pre-tax national income, we need to add social insurance benefits and deduct social insurance contributions. The aggregate difference between benefits and contributions, the social insurance surplus or deficit, is allocated to individuals proportionally to their pre-tax factor income, in line with the guidelines for Distributional National Accounts (Blanchet *et al.*, 2021). Average income remains the same by construction, but the distribution changes when going from factor to pre-tax national income. The income share of the bottom 50% increases to 21.5% at the expensive of the middle 40% and top 10%, whose shares fall to 43.3% and 35.3% respectively. The quality of our data allows us to dissect the very top of the income distribution, considering a group as small as the top 0.0001%, a group roughly equal in size to the group of Dutch billionaires, who account for 0.3% of pre-tax factor income.[28] Comparing the Netherlands to other countries, we show in Figure 3.1 that pretax income inequality in the Netherlands, as measured by the top 10% income share, lies above that of France and Austria and is most similar to that found in Germany and Italy.[29]

[28] According to the magazine *Quote*, which compiles the Dutch annual rich list, 18 billionaires lived in the Netherlands in 2016. Our ranking of individuals is based on income rather than wealth, but the inclusion of retained earnings means that there is considerable overlap between top income earners and top wealth holders. It is worth noting here that the standard to split income equally among adult household members in a sense understates the income share of billionaires because most billionaires are married to non-billionaires.

[29] We show the international comparison for the top 1%, middle 40% and bottom 50% income shares in Figures A.1, A.2 and A.3, respectively.

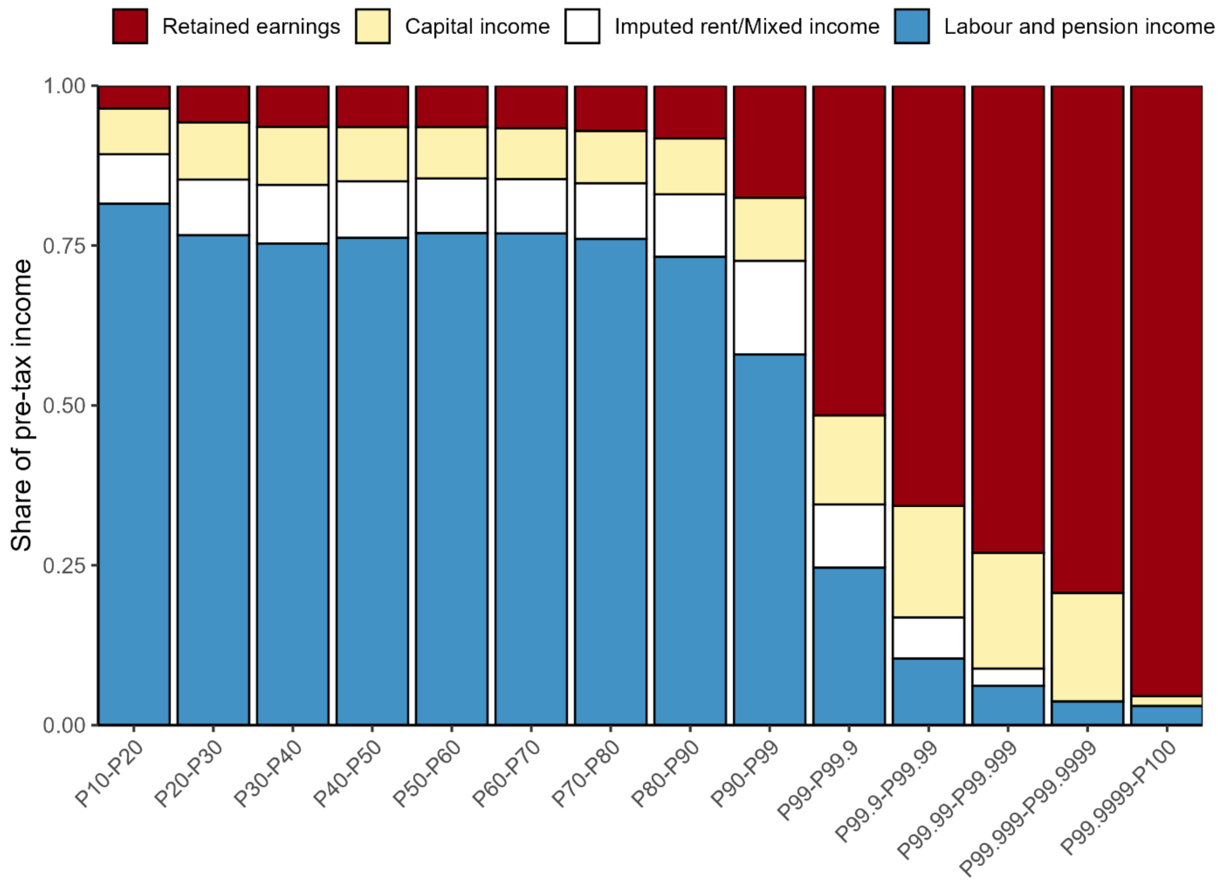
Figure 3.1: The share of income accruing to the top 10% in 2016



Note: This figure shows the share of pre-tax national income and post-tax national income accruing to the 10% income group, for a set of countries for which comparable estimates are available. We use our results for the Netherlands, Bozio *et al.* (2024) for France, Jestl and List (2022) for Austria, Bach, Bartels and Neef (2023) for Germany, Guzzardi *et al.* (2024) for Italy, Khalid and Yang (2021) for Malaysia, Piketty, Yang and Zucman (2019) for China, Piketty, Saez and Zucman (2018) for the US, Novokmet, Piketty and Zucman (2018) for Russia, Assouad (2023) for Lebanon and Chatterjee, Czajka and Gethin (2023) for South Africa.

In addition to the obvious differences in the level of income across the income distribution, there are striking differences in the source of income. We show in Figure 3.2 how each income group derives their income from different sources. Labour income and pension benefits make up most of the bottom 90%'s income, but fall in significance for the top 10% and in particular the top 1%. Conversely, capital income and retained earnings play a minor role for the bottom 90%, while dominating the incomes at the top. These patterns show the importance of considering retained earnings when studying the incomes of the rich, often overlooked in traditional inequality studies which focus on personal income.

Figure 3.2: The composition of pre-tax national income



Note: This figure presents the composition of pre-tax income, by group of pre-tax income. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. The decomposition of income is obtained by summing all components of pre-tax national income for each income group, and dividing by the total income accruing to this group.

3.4.2. The Anatomy of Retained Earnings

The importance of retained earnings at the top of the income distribution warrants a closer look. The Netherlands functions as a conduit country used by multinational corporations for the purposes of profit shifting (Weyzig, 2013; Lejour, 2021). This makes it particularly important to distinguish between retained earnings ultimately accruing to Dutch and foreign households, as well as the corporate taxes paid by either type of household.[30] Furthermore, we need to consider both earnings retained by domestic firms and by firms abroad. Relying on highly disaggregated tables from the national accounts, we find that Dutch households had a claim on retained earnings in both domestic and foreign corporations of 81.9 billion euros or

[30] We provide a step-by-step account of how we make this distinction in Appendix D.1.

14% of national income. Almost 60% of these earnings were retained by domestic firms (47.6 billion euros, 8% of national income), while the remainder was retained by firms abroad. The corporate taxes that ultimately accrue to Dutch households amounted to 19.8 billion euros (3% of national income).

Note that this is lower than the total in corporate taxes received by the government because the latter also includes taxes paid by foreign-owned corporations. We do not assign retained earnings accruing to and corporate taxes paid by foreign households to Dutch households.

The ownership registry for closely-held businesses allows us to unravel ownership chains and link domestic firms' retained earnings to shareholders. Tracing ownership through several layers of ownership, we recover 34.1 billion euros (6% of national income) of earnings retained by closelyheld businesses that belong to Dutch shareholders. This does not yet cover earnings retained by widely-held firms. To get at this, we use the fact that 7% of households' shares are held in widely-held firms and assume that payout rates are the same between closely and widelyheld firms. This yields an estimate of earnings retained by widely-held firms attributable to households through their equity ownership of 2.4 billion euros (0.4% of national income), which we assign to individuals proportionally to their equity in widely-held firms. This brings the total of retained earnings that accrue to Dutch households through their equity ownership to 36.5 billion euros (6% of national income). The remaining 11.1 billion euros[31] (2% of national income) in earnings retained by domestic firms accrue to either pension funds or the government. The part that accrues to pension funds is assigned to individuals proportionally to their pension entitlements. The part accruing to the government is treated like other capital income earned by the government and assigned to individuals in proportion to their pre-tax factor income. In Table A.8, we show the impact of including retained earnings in our definition of income. The top 10% income share falls from 35.3% to only 29.1% when we exclude retained earnings.[32] The discrepancy only grows when zooming in on the top: ignoring retained earnings

[31] 47.6 billion euros minus 36.5 billion euros.

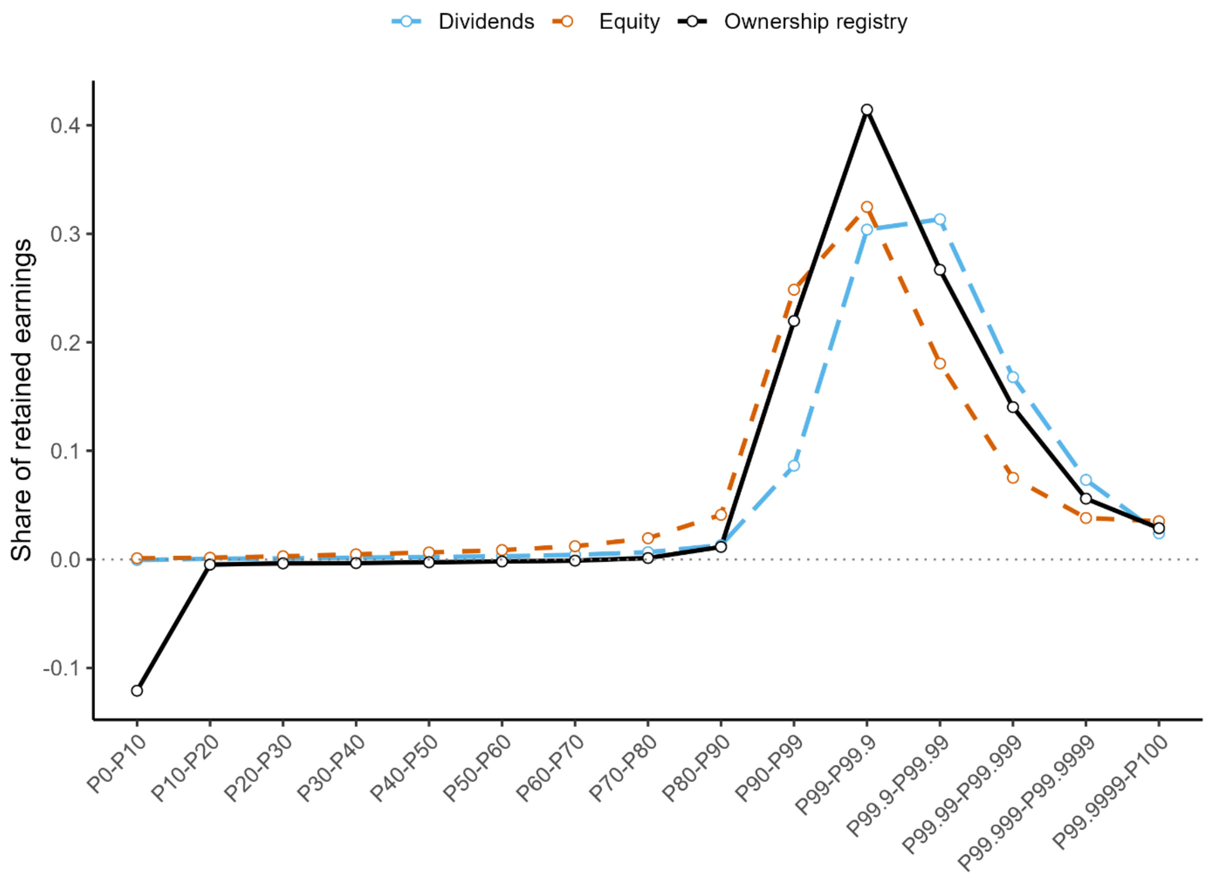
[32] The pre-tax income shares that exclude retained earnings are similar to those in Caminada et al. (2021).

understates the income share of the top 0.0001% by a factor 3. Income groups below the top 10% are less affected, since almost all retained earnings are concentrated among the top 10%.

The use of the ownership registry to precisely trace retained earnings to shareholders is an important contribution of our study. In the absence of such a registry, other studies have allocated retained earnings in proportion to either equity wealth or dividends. We find that the use of either of these methods approximates the overall level of inequality well. However, each of these methods has distinct problems and the richness of our data allows us to explore them. We do this in Figure 3.3, which shows each income group's share in total retained earnings under different allocation methods. A problem shared by both the dividend and equity allocation methods, is that negative retained earnings, which are very common in the microdata, are ignored. The amount of retained earnings recorded in the national accounts is the net result of positive and negative retained earnings. Therefore, the equity and dividend methods tend to underestimate the amount of retained earnings accruing to the top of the income distribution (where retained earnings are typically and partly mechanically positive)[33], and overestimate the amount accruing to the bottom (where negative retained earnings are concentrated). Concretely, we show in Figure A.5 that the equity and dividend allocation methods understate the top 10% income share by as much as 3% (1.2%-points).

[33] In Figure A.4 we also show the distribution of retained earnings if we cap losses at 0.

Figure 3.3: The distribution of retained earnings under different allocation methods



Note: This figure presents the distribution of retained earnings. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. Specifically, retained earnings are summed by each income group and then divided by total retained earnings.

Assigning retained earnings in proportion to dividends naturally amplifies the income of those who receive dividends. This is problematic because, conditional on the level of profits, there is a mechanical negative relationship between dividends and retained earnings. Furthermore, this allocation method rests on the assumption that the share of profits retained and distributed does not change with the level of income. We can test this assumption empirically and we show in Figure A.6 that the share of profits distributed falls sharply up until the 90th percentile.[34] It is then relatively flat within the top 10%, with the notable exception of the top

[34] Note that for the income groups below the 70th percentile, profits by closely-held corporations are miniscule and, on aggregate, negative, which means we cannot express retained and distributed profits as a share of the total.

0.0001% who retain almost all of their profits. This is in line with the finding by Saez and Zucman (2020) that billionaires in the United States often own non-dividend paying stocks.

It is less common to assign retained earnings proportional to equity wealth, mostly due to the paucity of administrative data on wealth. In some studies, equity wealth is obtained through capitalising dividends and realised capital gains, in which case many of the previously mentioned concerns remain valid. If instead, equity wealth is taken directly from administrative or survey data, the required assumption is that the rate of return on equity does not differ by income group. This goes against widespread evidence that rates of return are correlated with wealth (Fagereng *et al.*, 2020; Bach, Calvet and Sodini, 2020). In Figure A.7 we divide each income group's claim to profits by its equity wealth. The resulting "rate of return" should be interpreted with caution. The fact that the rate increases with income has two causes. Firstly, there is the true increase that reflects a greater degree of financial sophistication and access to investment opportunities at the top of the income distribution. Secondly, the shares in closely-held businesses are notoriously difficult to value and an undervaluation of these shares automatically leads to an overstatement of rates of return. The problem of undervaluation may be less pressing at the very top because shares are more often held in publicly traded firms, possibly through holding firms.[35] Still, for the Netherlands allocating retained earnings in proportion to equity wealth results in the largest understatement of top income shares due to the positive correlation between the rate of return and income, regardless of its source.

It is important to note that the ownership registry, while a substantial improvement, still faces limitations. The most important is that of cross-border ownership of firms, which is particularly prevalent at the top of the distribution. While we capture the distributed portion of foreign profits, we cannot observe earnings retained abroad. This issue is unfortunately inherent in most national data sets. Future research may be able to use country-by-country reports now required from multinational corporations, but these suffer from their own issues, such as the

[35] We do not try to correct for undervaluation of closely-held shares as our method does not depend on it directly. We observe retained earnings at the firm-level and assign these to individuals in proportion to their ownership share. For an attempt to correct for the undervaluation of shares in closely-held firms, see Toussaint et al. (2020) and Toussaint (2024).

incomplete coverage of firms. A second issue is that in any given year, a substantial number of firms reports business losses. We address this by adding back certain tax deductions, but the extent to which other forms of tax planning distort corporate tax returns remains an open question that needs to be studied in future research.

3.5. Redistribution

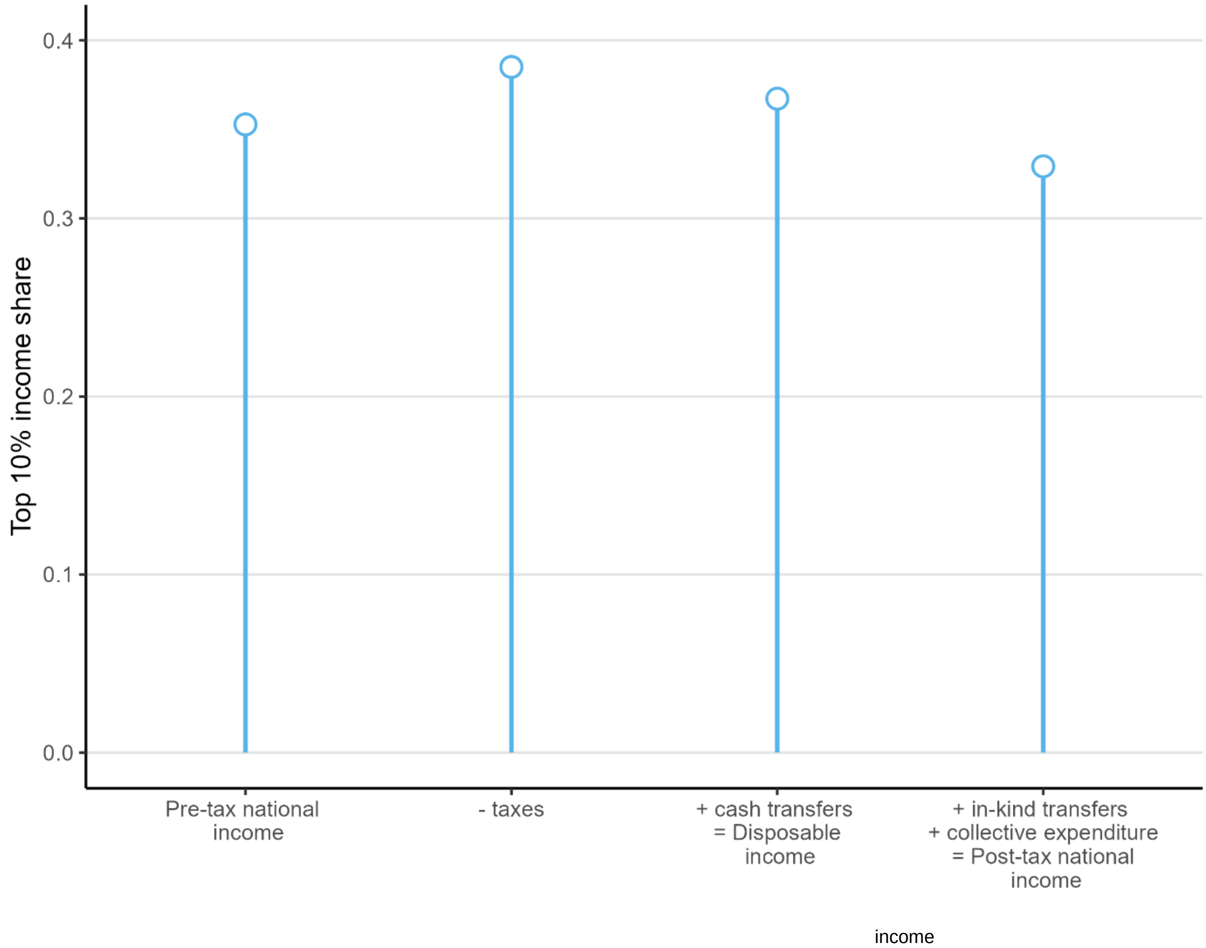
3.5.1. From Pre-tax to Post-tax National Income

Post-tax national income is obtained by adding all forms of government spending to and subtracting all taxes from pre-tax national income. This is the income that can be used to accumulate wealth or to consume private and public goods and services. We show the transition in the top 10% share of income as we move from pre-tax to post-tax income in Figure 3.4.[36] From this, we can see that the reduction of inequality in the Netherlands is the result of the progressivity of government spending rather than that of taxation.

The difference in the inequality of pre-tax and post-tax national income can be seen as the result of two factors. The first factor is that different income groups receive different amounts of government spending and pay different amounts of taxes. The second factor is related to the fact that there is considerable variation in spending received and taxes paid by individuals even within income groups, so that individuals may change income group when moving from pre to post-tax income. Having access to dozens of administrative datasets related to both government spending and taxation makes this paper uniquely suited to study the variation in the net benefit from redistribution. In Figure 3.5, we show the distribution of the net benefit for each pre-tax income group. Most individuals in all income groups receive between -25,000 euros and 25,000 euros in government spending net of taxes, but there is a non-negligible group in the lower income groups that receives government spending in excess of 50,000 euros. Such large amounts are typically associated with health care and long-term care and can push low pre-tax income individuals into high post-tax income groups.

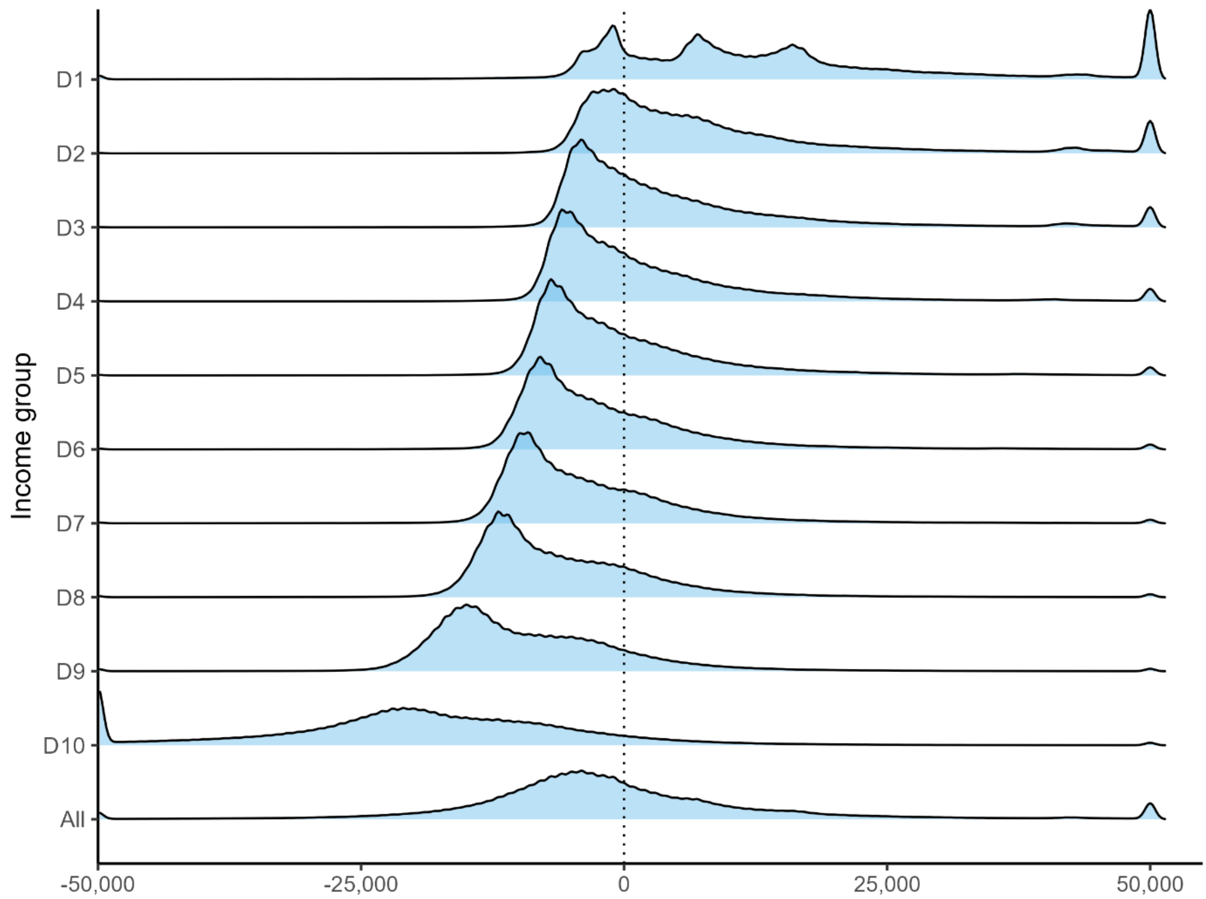
[36] Figures A.8–A.15 shows the same evolution for the income shares of the middle 40% and the bottom 50%, P99P99.9, P99.9-P99.99, P99.99-P99.999, P99.999-P99.9999, P99.9999-P100 and the Gini coefficient, respectively.

Figure 3.4: Top 10% income share under different income concepts



Note: This figure presents the top 10% share of income under different income concepts. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by either pre-tax national income, pre-tax national income net of taxes, disposable income, or post-tax national income.

Figure 3.5: The distribution of government spending net of taxes within each income group



Note: This figure shows the difference between government spending received and taxes paid by each income group in the Netherlands in 2016. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income.

3.5.2. Anatomy of Redistribution: Taxes

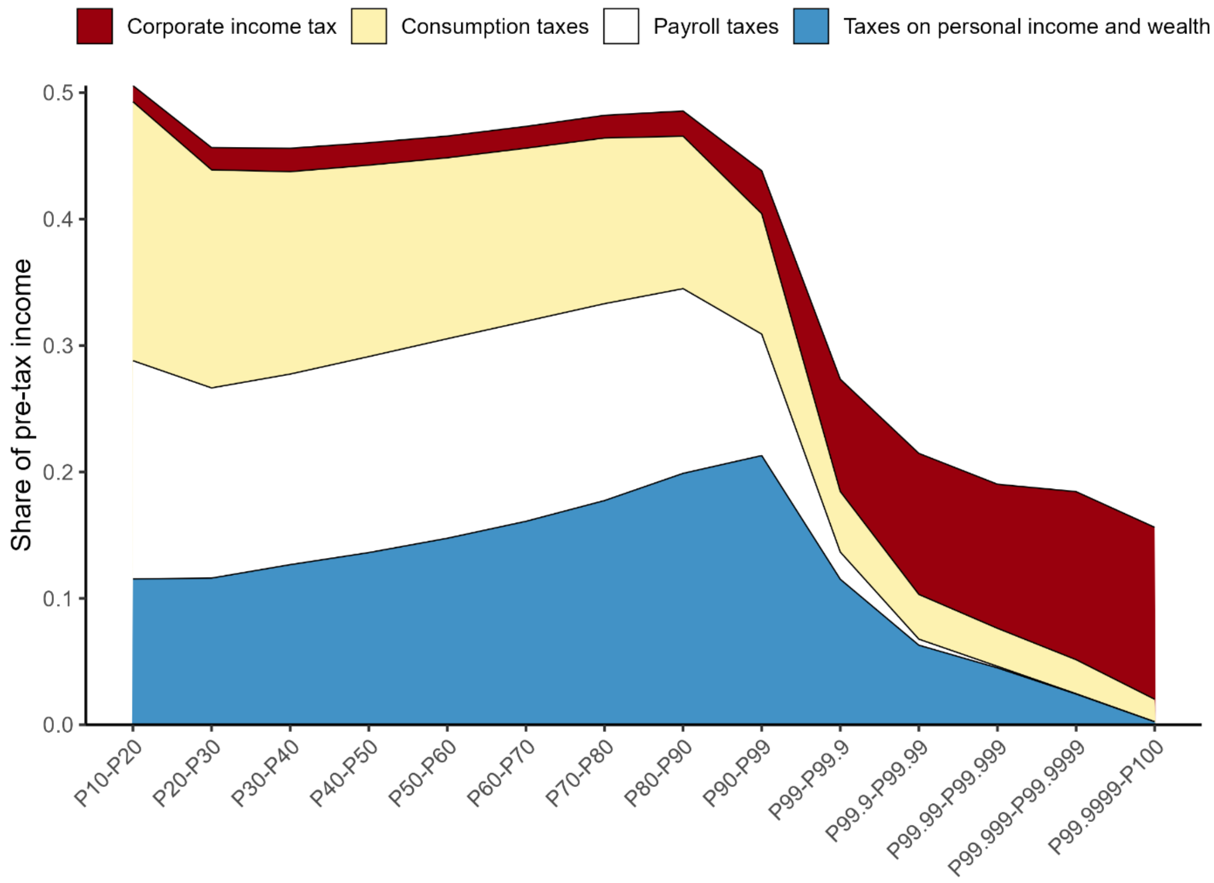
In our analysis of redistribution, we consider all taxes and divide them into four broad categories: taxes on income and wealth, corporate taxes, payroll taxes and consumption taxes. In line with the Distributional National Accounts methodology, we assign taxes to the corresponding factor of production: taxes on labour are assigned to workers, taxes on capital are assigned to the owners of capital. In doing so, we disregard the statutory incidence of taxes: payroll taxes paid by employers are assigned to employees. Consumption taxes are assigned to consumers in proportion to their consumption of taxed goods. Note that this exercise tries to establish who pays taxes, taking as given pre-tax incomes, coined *distributional current-tax analysis* by Saez and Zucman (2023). This differs conceptually from analysing the incidence of (hypothetical) tax reforms, *distributional tax-reform analysis*, which studies how pre-tax and post-tax incomes change in response to changes in tax rates or bases.

The macroeconomic effective tax rate in the Netherlands is equal to 45% of pre-tax national income. Figure 3.6 shows how this rate varies by income group. This figure includes all taxes and social contributions paid to the government. Strictly speaking, some social contributions are deducted when going from pre-tax factor to pre-tax national income. Still we have included these here to answer the question of how much of all taxes and social contributions each income group pays.[37] The tax burden is highest for the lowest income groups with a rate close to 50% of pre-tax national income. It stabilises around the macroeconomic average for income groups between the median and the 99th percentile before falling dramatically to somewhat below 20% for the top 0.0001%.[38] This regressive profile means that inequality increases due to the operation of the tax system, as can be seen in Figure 3.4. The top 10% income share increases from 35.3% for pre-tax national income to 38.5% when taxes are deducted.

[37] In Figure A.16, we exclude payroll taxes.

[38] There exists a tradition of estimating the distribution of the tax burden in the Netherlands, but these notably exclude retained earnings and corporate taxes from their analysis as well as a number of smaller taxes such as the inheritance tax. See for example De Kam et al. (1996) and Trimp and De Kam (2011).

Figure 3.6: The effective tax rate by tax type



Note: This figure shows the effective tax rate faced by each income group in the Netherlands in 2016, decomposed by type of tax. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. The effective tax rate is obtained by adding up all taxes paid by each income group and dividing by the pre-tax national income of that group.

The detailed nature of our data allows us to study the sensitivity of our results to different methodological choices. In Figure A.20, we document how the tax burden profile changes when we assign retained earnings and corporate taxes proportionally to either equity wealth or dividends. While the equity and dividend methods somewhat overstate the tax burden of the top 1%, they confirm the general finding of tax regressivity.

Combining our result with studies conducted in Italy, France and the US using the same methodology allows us to draw several general conclusions.[39] On average the Dutch tax burden

[39] For the United States, we use the tax profiles in Saez and Zucman (2019). For France, we show the tax profiles from (Bozio et al., 2024) up until P99.99-99.999. For the top group, P99.9999-100, we rely on estimates by Bach et al. (2023). For Italy, Guzzardi et al. (2024) estimate the tax profile up until the top 0.1%. We show this top group here as P99.9-99.99. The data for Italy's top group is an estimate of the tax rate faced by the late Silvio Berlusconi,

lies above that of the US at a level similar to that of France, but Figure 3.7 shows that the Netherlands is in fact a high-tax country for low income groups and a low-tax country for the highest earners.[40] Tax progressivity is ultimately determined by the interplay of two types of taxes, as we show in Figure 3.8: consumption and payroll taxes which tend to be regressive and corporate and personal taxes on income which tend to be progressive.

Consumption taxes are typically regressive because the consumption rate falls with income (Blasco, Guillaud and Zemmour, 2023), as is the case in the Netherlands (see Figure C.1).[41] Some goods may be subject to reduced tax rates or may be exempt altogether, but these policies are usually insufficiently targeted to substantially increase tax progressivity (see Figure A.18).[42] The payroll tax burden falls with income for two reasons. Firstly, payroll taxes are levied on labour income and the income of the highest earners is predominantly composed of retained earnings and capital income. Secondly, payroll taxes often feature thresholds above which no additional tax is levied. This is also the case in the Netherlands. As a result, the average payroll tax burden falls rapidly when income exceeds these thresholds.[43]

one of Italy's most prominent billionaires, whose personal tax returns were made public when he was a senator in 2022. Data on his corporate shares were derived from ORBIS 2020 data. This estimate is purely illustrative and was shared with us by Demetrio Guzzardi.

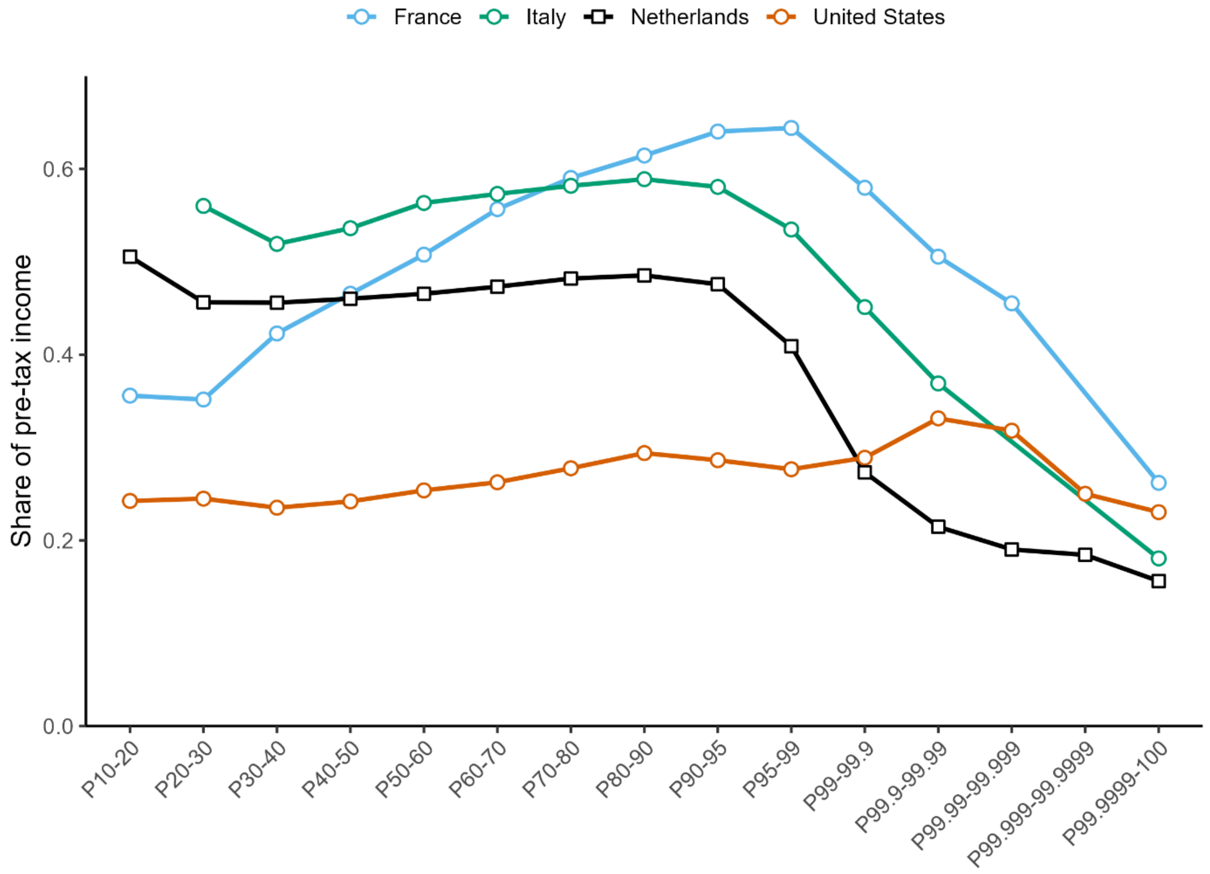
[40] It is important to note that we only consider taxes in this subsection. In addition to taxes, the receipt of government spending is an important factor determining the ultimate level of post-tax income, especially at the bottom of the income distribution.

[41] Consumption can be financed out of current income, savings, or cash transfers. In the latter two cases, individuals may pay consumption taxes even when their income is low.

[42] Bettendorf and Cnossen (2014) have shown that reduced rates and exemptions in the Dutch VAT have a minor effect on tax progressivity because the consumption patterns of the poor and the rich do not differ a lot in this dimension.

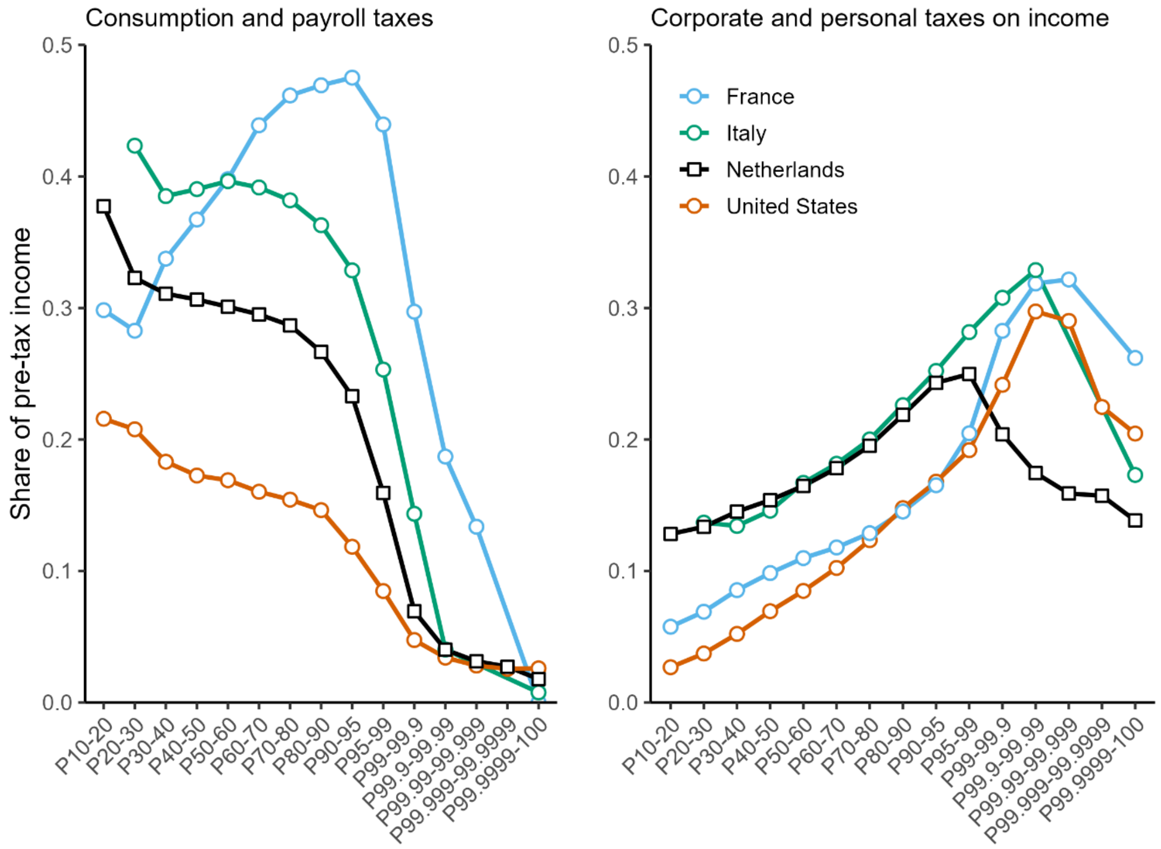
[43] France is a notable exception in that its payroll taxes are largely progressive. This is the result of a number of reforms during the past 50 years that have been studied by Bozio, Breda and Guillot (2023).

Figure 3.7: The effective tax rate in the Netherlands, Italy, France and the United States



Note: This figure shows the effective tax rate faced by each income group in the Netherlands in 2016, and a number of countries for which comparable estimates are available. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. For Italy, we use the 2015 profile from Guzzardi *et al.* (2024); for France, we use the 2018 profile from Bozio *et al.* (2024); for the United States, we use the 2018 profile from Saez and Zucman (2019). For the top group in France, we rely on a recent estimate by Bach *et al.* (2023). For the top group in Italy, we rely on an estimate shared with us by Demetrio Guzzardi which intends to reflect the effective tax rate faced by the late billionaire and politician Silvio Berlusconi.

Figure 3.8: The race for tax progressivity



Note: This figure shows the effective tax rate faced by each income group in the Netherlands, Italy, France and the United States, decomposed by tax type. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. The left panel shows the sum of consumption and payroll taxes as a percentage of pre-tax national income for each income group. The right panel does the same, but for corporate and personal taxes on income and wealth.

The personal income tax often exempts those on very low incomes and generally features multiple tax brackets with increasing marginal tax rates. These elements make that the personal income tax burden increases with income.[44] At the very top, income is often retained within (holding) firms in such a way that no personal income tax is due, explaining the decreasing importance of this tax among the top 1% of earners (see Figure A.19).[45] This is only partially offset by the corporate income tax whose headline rate lies considerably below the

[44] The progressive profile of the Dutch income tax has previously been documented by Caminada et al. (2021).

[45] Yagan (2023) similarly finds that the federal income tax imposes a burden of less than 10% of Haig-Simons income on the United States' 400 wealthiest families. Advani, Hughson and Summers (2023) finds a similar though less pronounced decline in the effective tax rate at the top of the distribution in the United Kingdom.

top personal income tax rate but which is levied regardless of whether profits are distributed and therefore acts as a sort of minimum tax for the very wealthy.

3.5.3. Anatomy of Redistribution: Spending

In a recent study of 151 countries, Fisher-Post and Gethin (2023) show that it is common for tax systems to be flat and for the spending side to account for the bulk of redistribution. The wide range of administrative data sources in the Netherlands allows us to study who benefits from government spending in an exceptionally detailed manner.

Government spending can be divided into collective expenditure, in-kind transfers and cash transfers. Collective expenditure refers to government spending which is deemed nonindividualisable. Collective goods and services are i) delivered to all members of a community simultaneously, ii) consumed passively, without the explicit approval of each member, and iii) non-rival (Eurostat, 2013). All of these characteristics make it conceptually difficult to assign this type of spending to individuals. Some collective goods (e.g., street lights) seem to benefit all individuals more or less equally, while other goods (e.g., the protection of property) are of greater value to individuals with more property.[46] In line with the literature, we have decided to treat collective expenditure in a distributionally neutral manner and assign it proportionally to disposable income.[47]

We have access to administrative data covering virtually all cash transfers. Cash transfers can be divided into social security benefits (state pension, disability insurance, unemployment insurance, and sickness benefits), which are part of pre-tax national income, and social assistance benefits, which are not. We show a detailed decomposition of cash transfers in Figure 3.9.[48]

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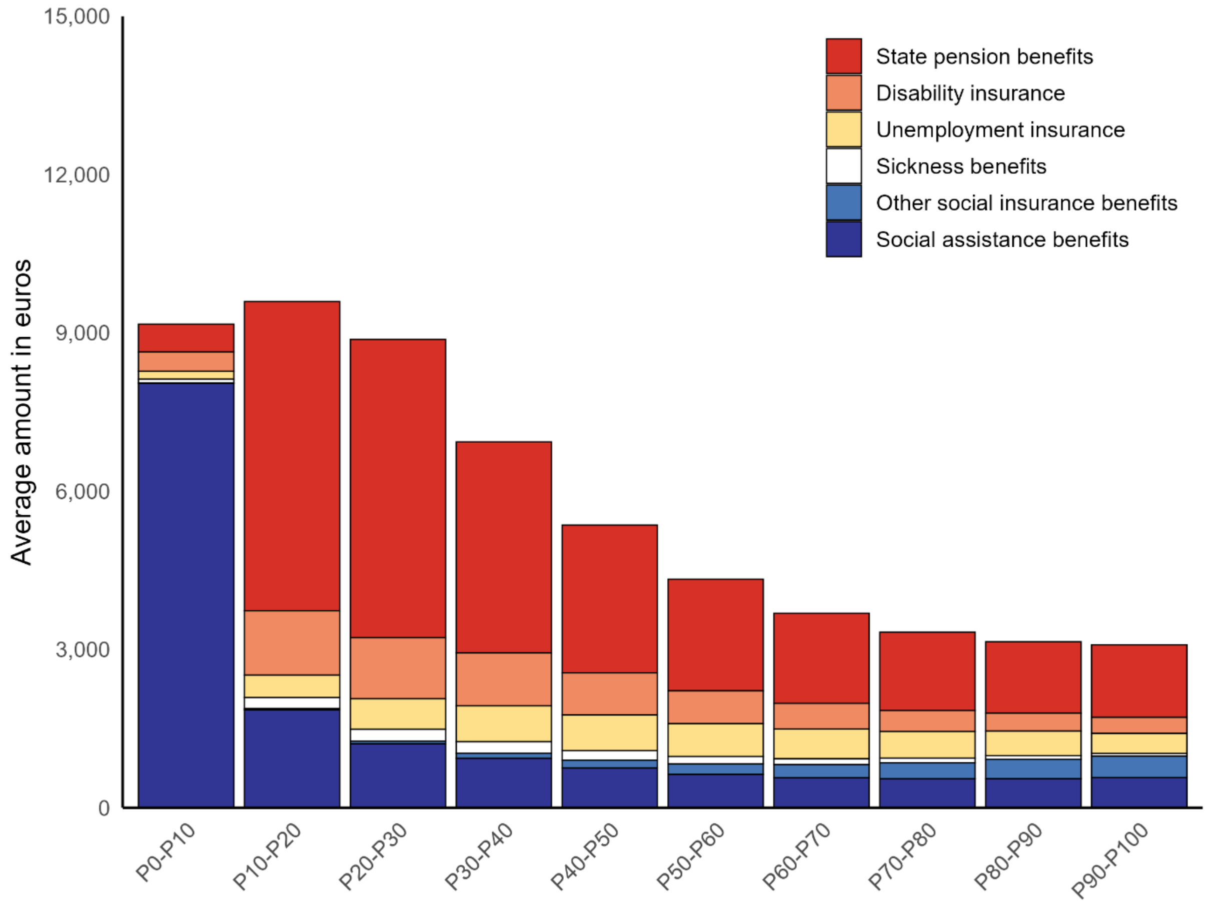
[46] The notion that the benefits of the protection of property offered by the state accrue largely to those who own property has historically been an important argument for the introduction of proportional or progressive tax schedules. See Seligman (1908) for a critical history of these arguments. Even spending on infrastructure may not benefit all citizens equally. Recent evidence from the United States documents substantial differences in road quality between poorer and more affluent neighbourhoods (Currier, Glaeser and Kreindler, 2023).

[47] For completeness, we also show the distribution of government spending if we assign collective expenditure on a lump-sum basis in Figure A.21.

[48] In Figure A.22, we divide cash transfers by each income group's pre-tax national income.

Overall, cash transfers are highest at the bottom of the income distribution, largely because of out-of-work welfare benefits. Because of the inclusion of social security benefits in pre-tax national income, their recipients are mechanically pushed up in the income distribution. The broadly universal nature of the state pension explains that even the top 10% of earners receives a small amount of cash transfers.

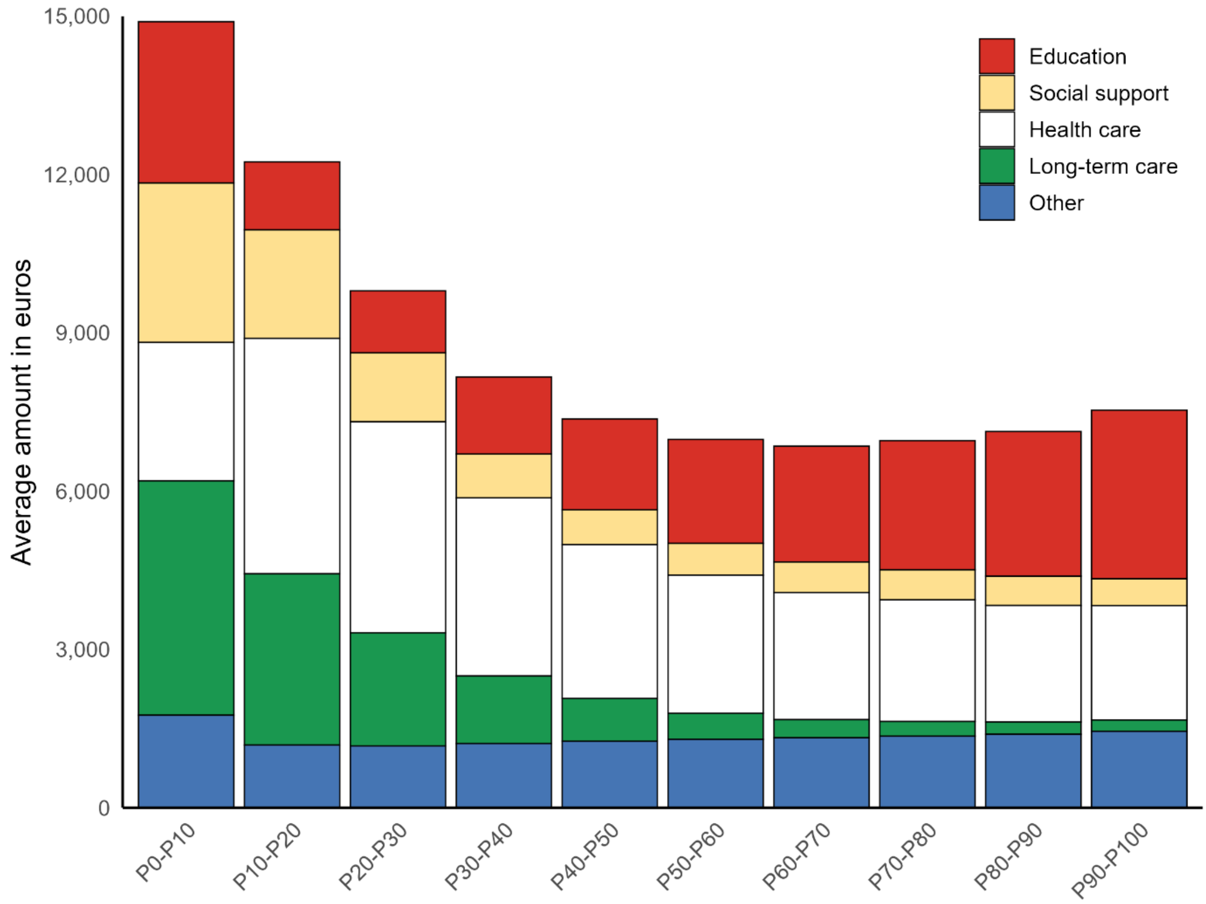
Figure 3.9: The average amount of cash transfers received by each income group



Note: This figure shows the amount of cash transfers received by each income group in 2016, with more detailed categories than in Figure 11. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. Transfers are assigned to the individuals who receive them or, in the case of individuals below the age of 20, their parents.

In-kind transfers make up by far the largest category of spending. In-kind transfers are goods and services, typically related to education or health care, provided to individuals without charge or at a heavily reduced cost. Some in-kind transfers take the form of cash payments that are conditional on the consumption of a specific good or service, such as rental support or child care subsidies. Figure 3.10 shows that, in absolute terms, in-kind transfers decrease with income up to the 70th percentile and then increase slightly. A more detailed decomposition can be found in Figure A.23. Note that despite this increase in absolute amounts, in-kind transfers still fall rapidly at the top of the income distribution when expressed as a share of income, as we do in Figure A.24.

Figure 3.10: The average amount of in-kind transfers received by each income group



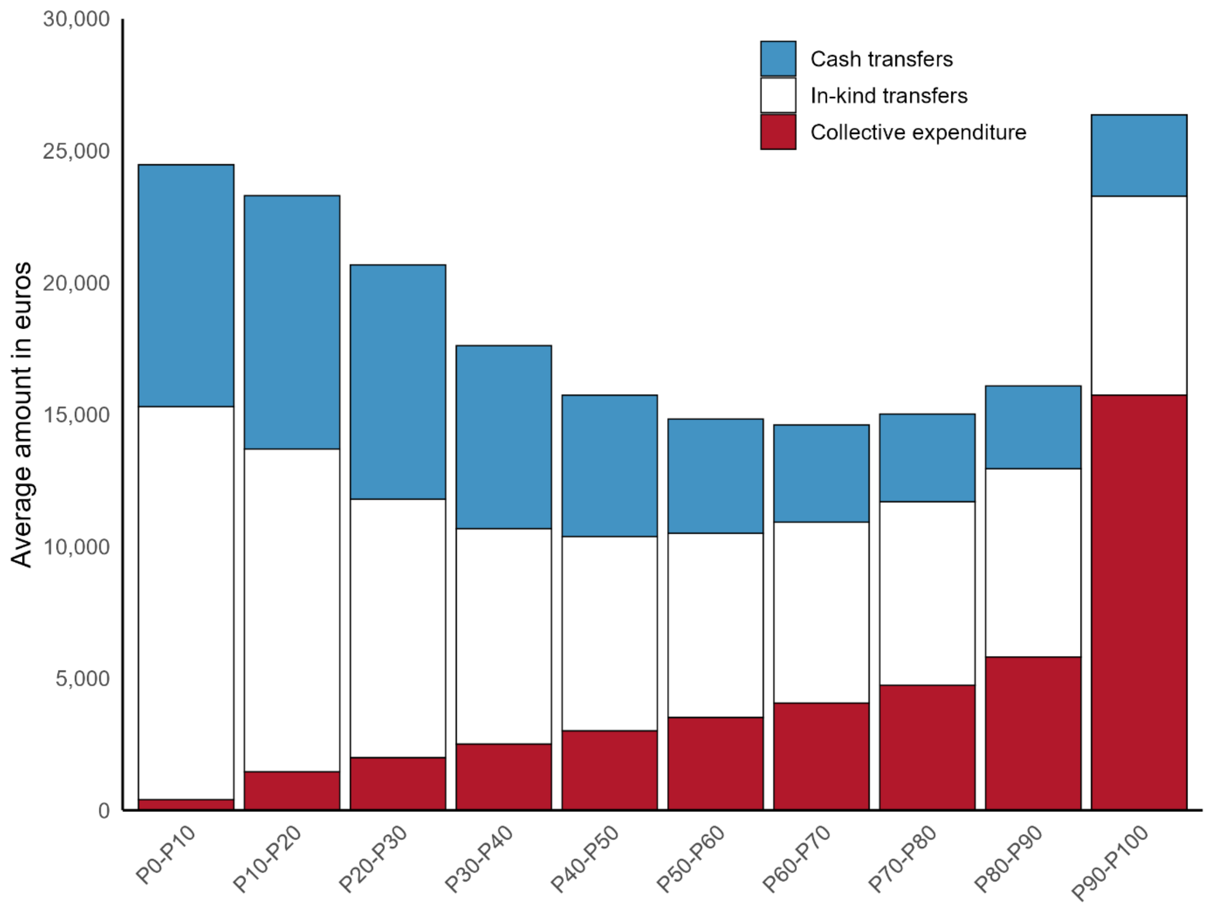
Note: This figure shows the amount of in-kind transfers received by each income group in 2016. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. Transfers are assigned to the individuals who receive them or, in the case of individuals below the age of 20, their parents.

Spending programs that fall under "social support" such as rental assistance or municipal social support are often explicitly means-tested which make this the most progressive type of government spending. Spending on health care, and long-term care in particular, also falls with income. On the one hand, this is the case because the conditions that give rise to health care consumption may also hamper an individual's earning capacity. On the other hand, government support for long-term care expenditure depends on both income and wealth tests, which may explain why higher income individuals often opt for publicly-funded home care which is less costly than institutional care (Tenand, Bakx and Van Doorslaer, 2020). The reason why the absolute amount of in-kind transfers increases at the top of the distribution is that education spending increases with income. This is not primarily the result of unequal access to education, but rather because the likelihood of having children increases strongly with income, as we show in Figure A.36.[49] At the bottom, fewer than 30% of adults is part of a household with children, while over 50% of the top decile is.

When we combine all types of government spending, as we do in Figure 3.11, we find that the average amount of all government spending falls with income, stabilises around the 70th percentile, and increases for the top decile. Naturally, the decreasing profile is starker when transfers are expressed as a share of income as we do in Figure A.25.

[49] We assign spending on education to the student if they are older than 20 and to their parents otherwise. This explains why a relatively large share of tertiary education spending is received by the bottom decile, around 15% of whom are students. When we assign all education spending to parents instead, the education spending profile does become steeper, but the overall pattern remains mostly driven by primary and secondary education.

Figure 3.11: The average amount of government spending received by each income group



Note: This figure shows the amount of government spending received by each income group in 2016. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. Cash and in-kind transfers are assigned to the individuals who receive them or, in the case of individuals below the age of 20, their parents. Collective expenditure is assigned to individuals in proportion to their disposable income.

Taken together, taxation and government spending reduces income inequality, as illustrated in Figure 3.4 which shows how the top 10%'s income share evolves when we subtract and add each component to pre-tax national income. Inequality reaches its highest level after removing taxes from pre-tax income, reflecting the regressive nature of taxation. It is reduced by cash and in-kind transfers, which are largest, relative to income, for the income groups at the bottom of the distribution. These components are thus the main drivers of redistribution in the Netherlands, as they are in most other countries (Fisher-Post and Gethin, 2023).

Sensitivity to distributional assumptions Despite the importance of in-kind transfers for overall redistribution, most studies rely on crude assumptions about their distribution because data is scarce. Since we directly observe the receipt of most in-kind transfers at the individual level, we are able to investigate the accuracy of different methods used to assign in-kind transfers to individuals and more generally assess the sensitivity of inequality statistics to different methodological choices.[50]

The most simple method for assigning in-kind transfers is to assign the same amount to each adult (the *Lump-sum* method).[51] A slightly different method is the one recommended by the World Inequality Lab's most recent Distributional National Accounts guidelines which assigns in-kind transfers related to health care in a lump sum manner, while assigning all other in-kind transfers proportionally to disposable income (the *WIL* method). The main motivation for this recommendation lies in the comparison between the United States and countries with public health care systems. This comparison is distorted if health care transfers are assigned to actual (mostly low-income) beneficiaries in the United States while being assigned like collective expenditure, i.e., proportionally to disposable income, in countries with public health care systems. This, however, presumes that no information exists on the use of health care in public systems, which is not necessarily true. Finally, some researchers have used tabulated data on average health care consumption by income group to assign health care spending to individuals (André, Germain and Sicsic, 2023; Gethin, 2023*b*) (the *Tabulated data* method).

How do these different methods compare to assigning in-kind transfers on the basis of their actual receipt? It is important to realise that a method may suffer from multiple biases, possibly offsetting each other. A method may thus return the "correct" level of redistribution for the wrong reasons. As we saw in Figure 3.10, in-kind transfers are highest at the bottom of the income distribution. This is a fact that both the lump-sum and WIL methods fail to capture. In this sense, both of these methods understate the degree of redistribution, as can be seen from panel A of Figure 3.12. The use of tabulated data overcomes this first type of bias by construction since it matches the average amount of transfers received by each pre-tax income group.

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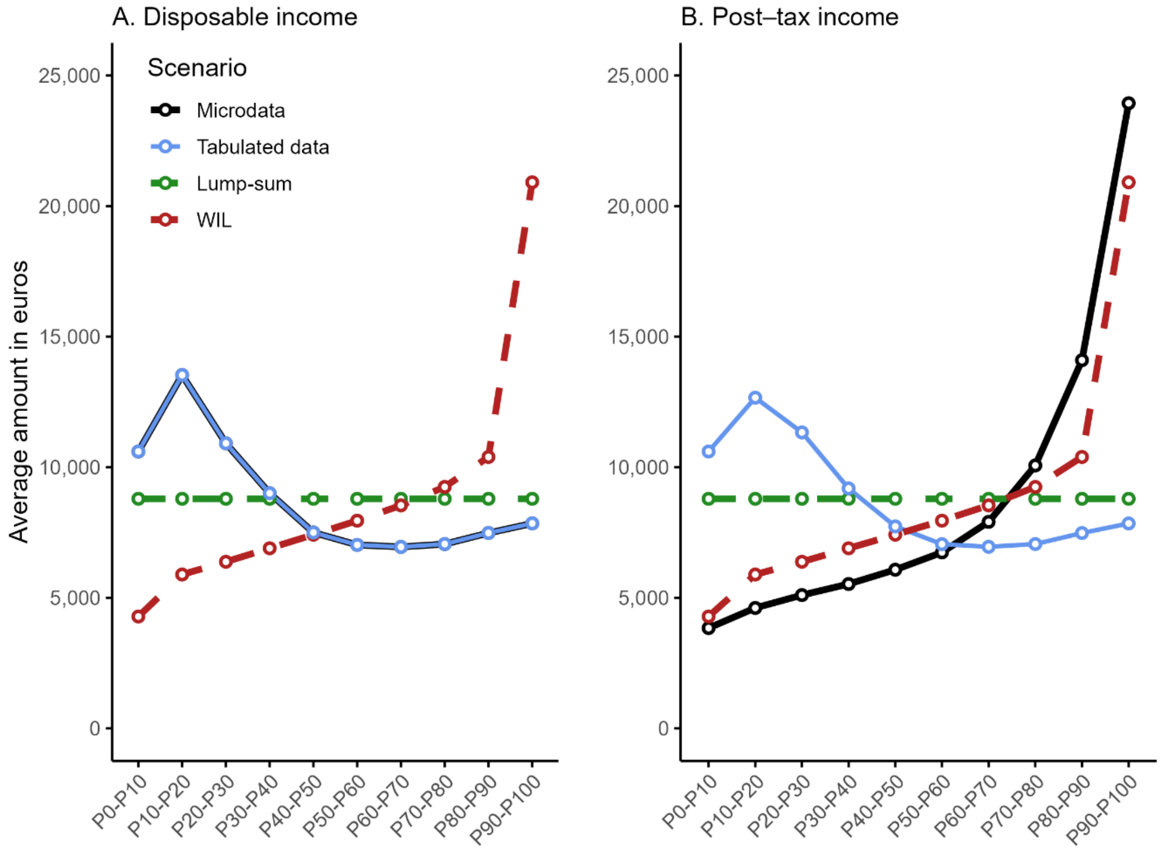
50 An interesting example of a paper showing the sensitivity of inequality statistics to methodological choices is Assouad (2023). This paper shows a decision tree containing the main assumptions and investigates how the top 10% income share changes when varying each of these assumptions.

51 In their preferred specifications, Jestl and List (2022) and Bozio et al. (2024) use the lump-sum method.

Figure 3.12: The average amount of in-kind transfers received by income group under different assumptions



Note: This figure shows the average amount of in-kind transfers received by each income group in 2016 under different distributional assumptions regarding the receipt of in-kind transfers. The unit of analysis is the individual adult and income is split equally among all adult members of a household. The *lump-sum* method assigns in-kind transfers equally across all adults. The *WIL* method assigns health care spending lump sum, while assigning all other in-kind transfers proportional to disposable income. The *Tabulated data* method assigns the average value of in-kind transfers received by an income group to all members of that income group. In the left panel, adults are ranked by their disposable income. In the right panel, adults are ranked instead by their post-tax national income.

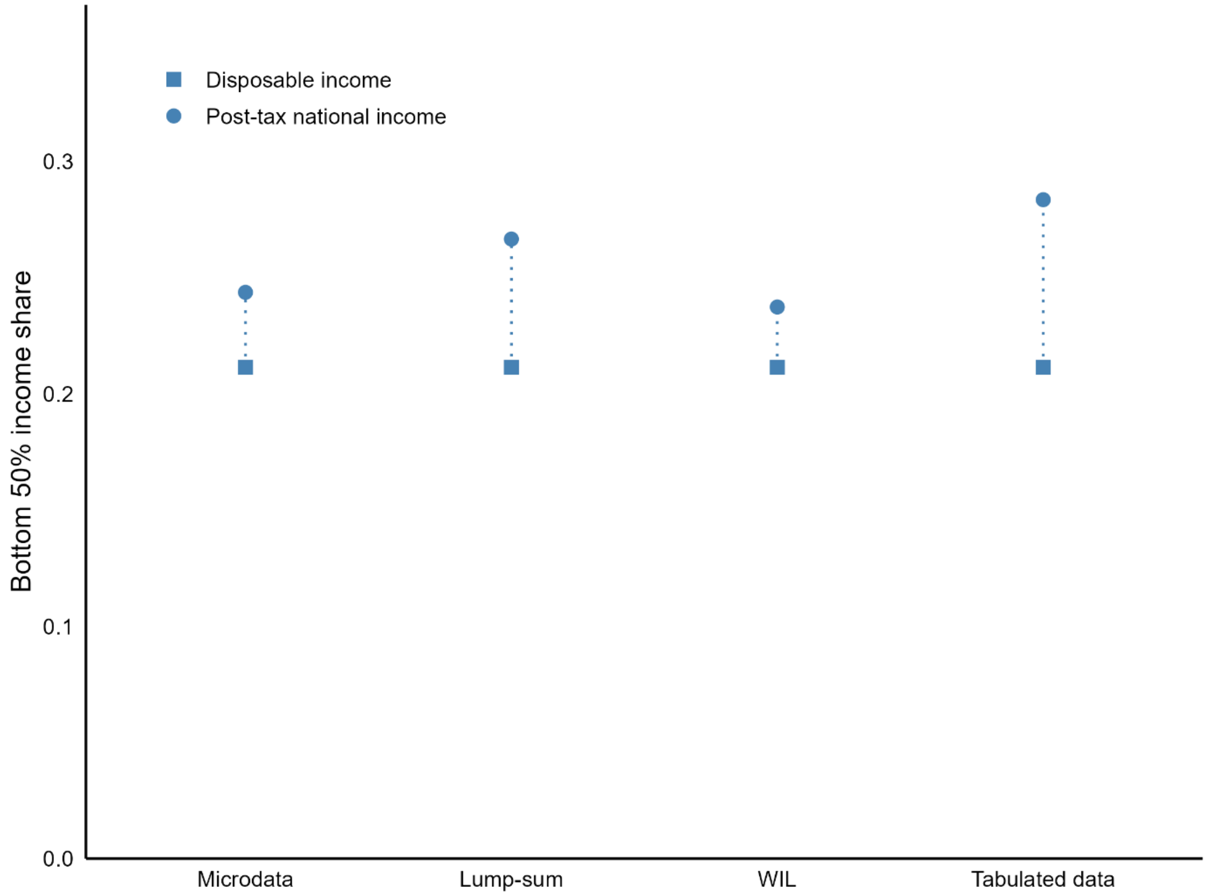
All these methods suffer from a second type of bias. They assign the same amount of in-kind transfers to individuals with the same level of income and therefore ignore inequality in the receipt of in-kind transfers conditional on income.[52] This inequality can be considerable, as we show in Figure A.32: most individuals receive in-kind transfers below a few thousand euros, but a non-negligible group receives transfers in excess of 30,000 euros. When we do assign in-kind transfers based on their actual receipt, individuals who receive a lot of in-kind transfers

[52] This concern can be mitigated if the tabulated data provides information on dimensions other than income, such as age or region.

will be pushed up in the post-tax income distribution at the expense of individuals who receive less. This explains why the average amount of in-kind transfers rises with post-tax income, as shown in panel B of Figure 3.12. In Figures A.26-A.30, we reproduce this figure for education, social support, health care, long-term care and other in-kind transfers separately. These figures show that most of the re-ranking of individuals is due to spending on health care and to an even greater extent long-term care. The WIL method (health care: lump sum, other in-kind transfers: proportional to disposable income) also returns a profile of in-kind transfers that increases with post-tax income, but does not do so for the right reasons: the average amount increases because a large fraction of in-kind transfers is assigned to individuals in proportion to their disposable incomes, regardless of whether these individuals actually receive in-kind transfers. One way to improve the allocation of in-kind transfers would be to match not just the average receipt, as in the *Tabulated data* method, but also the distribution of transfers conditional on income. This could be achieved, if data allows, by randomly assigning in-kind transfers within income groups so as to match the within-group variation of transfer receipt.

Ultimately, we show in Figure 3.13 how the redistributive impact of in-kind transfers varies by imputation method. As expected, the method that relies on tabulated data overstates the amount of redistribution most, followed by the lump-sum method. For the Netherlands, the WIL method actually comes closest to the microdata-based “truth”, but as we said, it does not do so for the right reasons. Another illustration of the important differences between the WIL and microdata scenarios in spite of similar amount of redistribution is presented in Appendix Table A.10, which shows transition matrices between groups of pre- and post-tax income, for different imputation methods for in-kind transfers. Our approach generates more re-ranking, with fewer individuals on the matrix diagonal (i.e., same income rank pre- and post-tax) and more moving up or down the income distribution as a result of taxes and government spending.

Figure 3.13: Inequality reduction through in-kind transfers under different assumptions



Note: This figure shows the share of disposable and of post-tax national income of the bottom 50% in 2016 under different distributional assumptions regarding the receipt of in-kind transfers. The unit of analysis is the individual adult and income is split equally among all adult members of a household. Adults are ranked by either disposable or post-tax national income. The *lump-sum* method assigns in-kind transfers equally across all adults. The *WIL* method assigns health care spending lump sum, while assigning all other in-kind transfers proportional to disposable income. The *Tabulated data* method assigns the average value of in-kind transfers received by an income group to all members of that income group.

Comparison to Blanchet, Chancel and Gethin (2022) Compared to our results, Blanchet, Chancel and Gethin (2022) find a lower level of pre-tax income inequality and a higher degree of redistribution. There are two factors that at least partially explain the low level of inequality. First, Blanchet, Chancel and Gethin (2022) calibrate their survey data on top-coded tax data tabulations, which mechanically suppresses top income shares.[53] Second, they use the ECB's Household Finance and Consumption Survey (HFCS). Unlike in other countries, the Dutch survey does not oversample wealthy households, meaning that they are largely missing from

[53] Specifically, dividend income is capped at 250,000 euros.

the survey (Vermeulen, 2018). Consequently, Blanchet, Chancel and Gethin (2022) conclude that the top 10% of earners owns a rather low 21.7% of corporate stocks. As a result, adding retained earnings in proportion to stocks only increases their top 10% income share by 1.0%-point, compared to more than 6%-points according to our estimates. One factor explaining part of the discrepancy in measured redistribution is that Blanchet, Chancel and Gethin (2022) allocate non-health in-kind transfers and collective expenditure proportional to the sum of disposable income and a lump-sum amount for health care spending (instead of proportional to only disposable income, as prescribed by Blanchet *et al.* (2021)). This raises their bottom 50%'s post-tax income share by almost a full percentage point.

Discussion of the post-tax income concept Our analysis emphasises the sensitivity of the redistributive impact of in-kind transfers to distributional assumptions. Our results reveal the importance of using individual data for the distribution of in-kind transfers if the goal is to determine which individuals actually benefit from government spending. Yet the granularity of our data also sheds light on previously overlooked conceptual issues regarding post-tax national income. When assigning in-kind transfers on the basis of their actual receipt, individuals receiving high amounts of health care-related in-kind transfers could end up at the top of the post-tax income distribution. This is less true for cash transfers because their range is considerably smaller.

Many in-kind transfers aim to alleviate specific disadvantages such as being in poor health. It would therefore be wrong to conclude that individuals with high post-tax incomes are necessarily "well-off" in a non-monetary sense. A large literature has tried to more closely approximate a notion of "welfare" by accounting for differences in "need" due to differences in household composition by using so-called "equivalence scales" (Buhmann *et al.*, 1988). Aaberge *et al.* (2010), Aaberge *et al.* (2019) and Aaberge, Langørgen and Lindgren (2024) further try to address differences in "needs" for in-kind transfers with specific equivalence scales for in-kind transfers. It is important to note, however, that we have thus far only considered inequality in income and have not made any claims regarding welfare. Estimating inequality in welfare is an immeasurably more ambitious as well as contentious exercise which would require accounting not just for income, wealth, but also tastes, health (of oneself, of family members and friends), age, relationship status, and equivalence scales only very partially do so.

There are a few more reasons why we do not use equivalence scales. These scales typically depend on the number and age of household members, and are applied to pre-tax income, taxes and government spending to obtain “equivalised income”. This breaks the link between inequality statistics and the national accounts. The sum and growth of equivalised income are not equal to those of national income. Another problem is that the most commonly used equivalence scales do not depend on income and thus do not account for the fact that a substantial portion of income is not consumed but saved, especially so at the top of the income distribution. Under the commonly used modified OECD scale, a child aged 14 or above counts as half a consumption unit. Concretely, this means that having two such children reduces the equivalised income of a single parent on an average income by 22,000 euros, but that of a single parent in the top 0.0001% by 56 million euros. This income-independent adjustment poorly reflects the true change in needs associated with children and results in an understatement of inequality.

In-kind transfers make up almost half of all government spending and require further discussion. For any international comparison, it is naturally crucial that the same method for their allocation is used. However, we feel reluctant to allocate these transfers in a way that ignores who receives government transfers when data exists that identifies the actual recipients. An important reason is that this creates a somewhat arbitrary distinction between cash transfers, which are allocated to the actual recipients, and in-kind transfers, which are not. The distinction between these different categories of spending can be blurry and so treating them differently would make measures of redistribution more fragile. In the case of spending on health care and long-term care, some have alluded to the idea of allocating these categories not on the basis of their receipt but according to their “insurance value”. There are several reasons why we have reservations about such an approach. First, while many forms of public health spending can be seen as providing insurance against the financial consequences of health shocks, many taxes and cash transfers provide insurance against income shocks. While it is interesting to consider the insurance value of all the different forms of government spending and taxes, it is outside of the scope of this project.[54] It then seems somewhat arbitrary to treat spending on health care and long-term care differently from other types of spending. Second, one might want to account for the fact that the insurance value is higher for the elderly given that they face higher health risks. However, it is unclear which factors to consider in addition to age and this adds another element of arbitrariness. Besides, if one has sufficiently granular data to compute the insurance value that reflects an individual's underlying health status, this value could be very close to the value of the spending actually received in the case of individuals suffering from chronic diseases. It is important to note that many such cases would actually not be covered by insurance in the absence of government regulation such as insurance mandates, defined sets of essential health benefits, and policies that prohibit insurers from screening on the basis of health status.

It is also worth noting that measuring redistribution as the difference between pre-tax and post-tax incomes can give an incomplete picture of the impact of government policy on inequality. As Bozio *et al.* (2024) argue, redistributive policies affect both pre-tax and post-tax incomes. For example, if high earners reduce their pre-tax income in response to high tax rates, the difference between pre-tax and post-tax income would understate the true equalising effect of government policies.

Finally, even though we study the redistributive impact of the system of taxation and government spending as a whole, it is worth mentioning that the primary goal of many government programs is not to redistribute across income groups. In the case of health care, for example, the intended redistribution is from the healthy to the unhealthy. Other programs explicitly redistribute from the young to the old. In the next section, we show how our analysis can be extended to study such redistribution along dimensions other than income.

3.5.4. Redistribution Across Social Groups

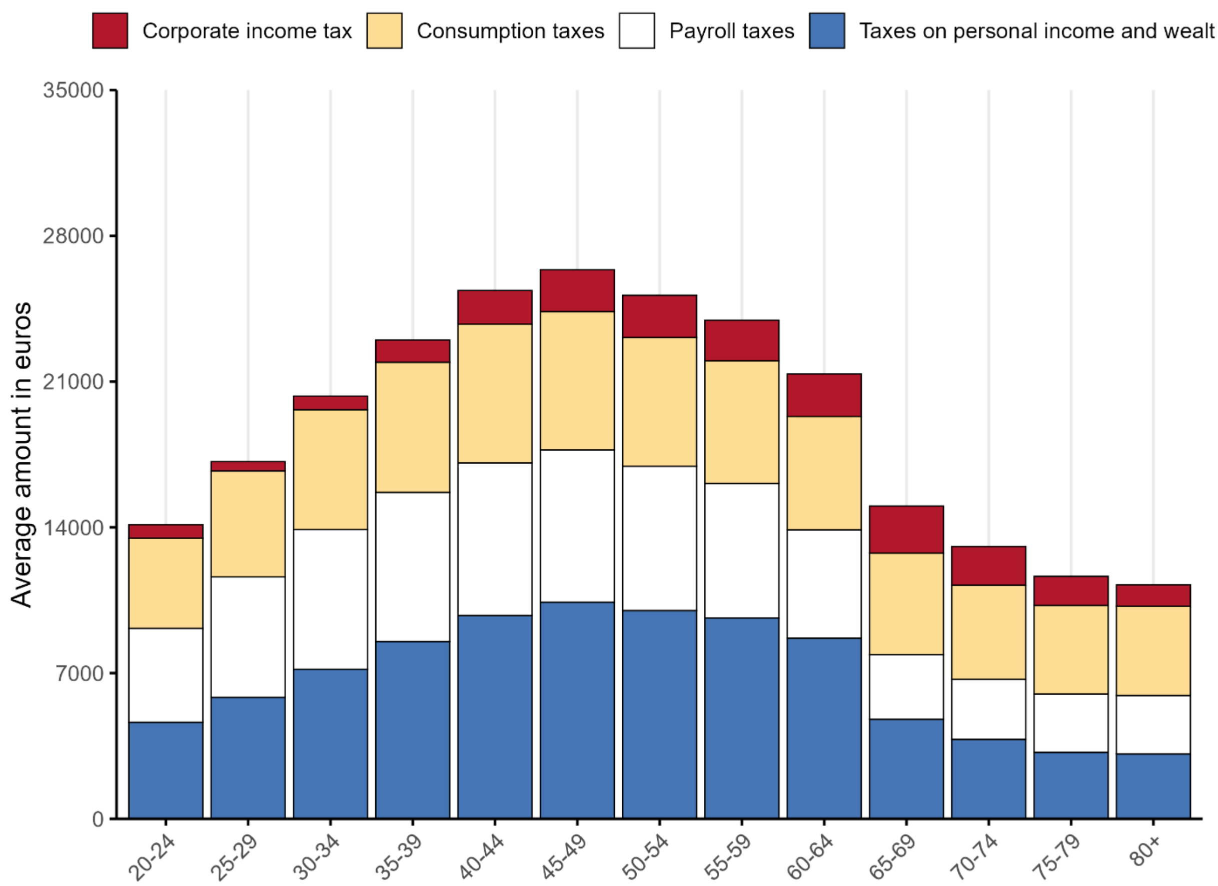
So far we have looked at inequality and redistribution along the income dimension, but both phenomena are more complex than that. In modern states, resources may be redistributed along many different dimensions, such as age, gender, or region. By linking our income data

[54] See e.g., Stepner (2019) for an attempt to estimate the insurance value of progressive taxes and transfers in Canada.

with other administrative data, we can study many of these different dimensions of redistribution.[55]

To take age as an example, we show how the average tax burden varies with age in Figure 3.14.[56] Since the majority of taxes are levied on either labour income or consumption, the distribution of taxes largely reflects the distribution of income across age groups, which we show in Figure A.34. The only tax category that increases roughly monotonically until the highest age groups is the corporate income tax, reflecting the higher concentration of equity ownership, both directly and indirectly through pension funds, among the old.

Figure 3.14: The average tax burden by age

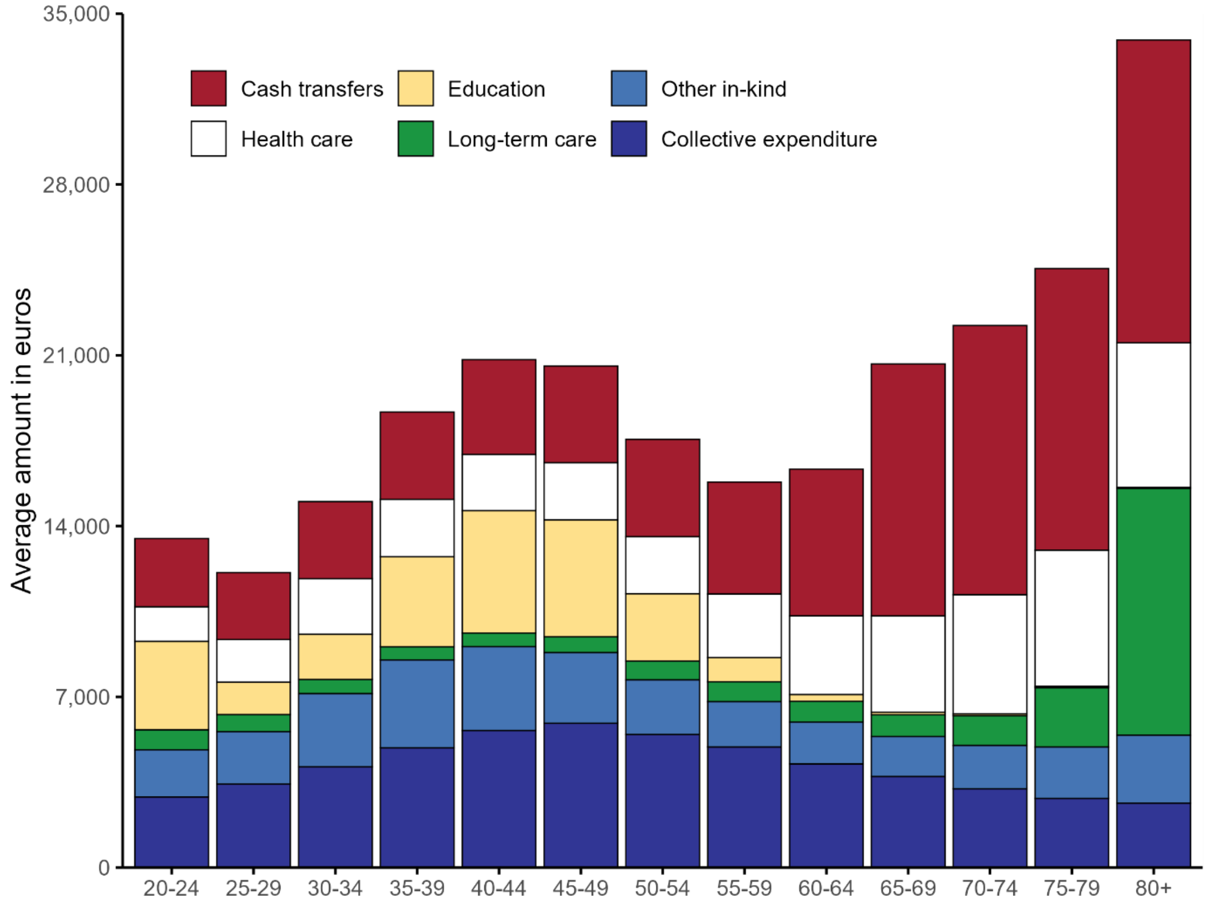


Note: This figure shows the amount of taxes paid for different age groups in 2016. The unit of analysis is the individual adult. Taxes on labour are assigned to workers. Taxes on capital are assigned to the owners of capital. Consumption taxes are assigned in proportion to the consumption of taxed goods and services.

[55] André, Germain and Sicsic (2023) also study inequality and redistribution across social groups.

[56] In Figure A.33 we show how the tax burden expressed as a share of pre-tax national income varies with age.

Figure 3.15: The receipt of government spending by age



Note: This figure shows the value of government spending received by different age groups in 2016. The unit of analysis is the individual adult. All cash and in-kind transfers are assigned to the individuals who receive them. Collective expenditure is assigned to individuals in proportion to their disposable income.

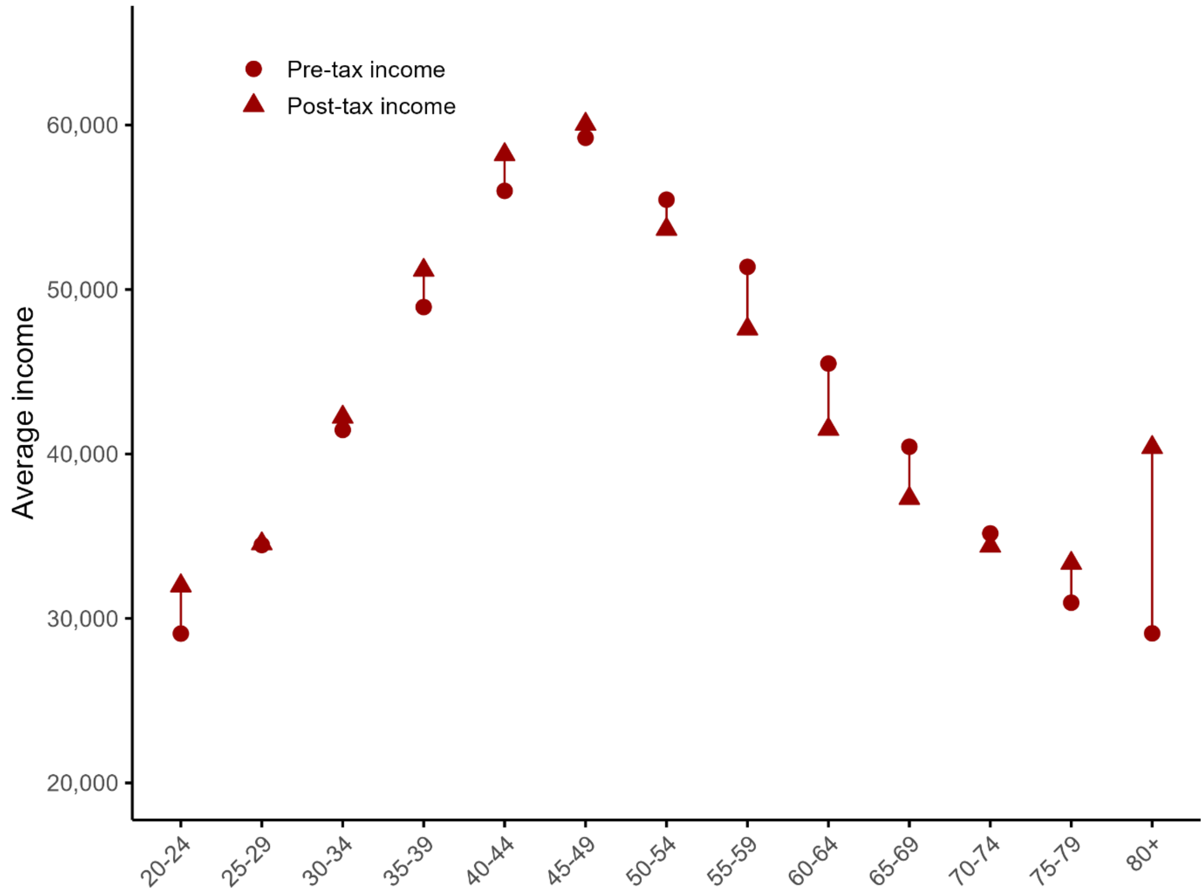
The age distribution of government spending, on the other hand, is not primarily determined by the income-age profile. Education spending is concentrated among the age groups that contain a high share of parents with school-going children, as well as among students in the 20-24 age group.[57] The receipt of health care-related transfers increases with age, but most clearly so for the 80+ age group, in part because of the large public long-term care sector in the Netherlands (Figure 3.15).

We combine taxation and spending to show the net impact of redistribution by comparing each age group's share of pre-tax and post-tax national income (Figure 3.16). Interestingly, most

[57] We show in Figure A.35 what share of adults in each income group belongs to which age group. In Figure A.36 we show the prevalence of different household types across the income distribution.

redistribution takes place between the age groups over 50, while those between the ages 25 and 50 receive roughly as much in government spending as they pay in taxes. Recall that the redistribution related to the social insurance system happens when going from pre-tax factor income to pre-tax national income and is thus not included here. When considered in a static framework as in this paper, redistribution through the social insurance system would mostly benefit those above the retirement age (around 65 in 2016) at the expense of the working-age population's older cohorts.

Figure 3.16: Pre- and post-tax income by age



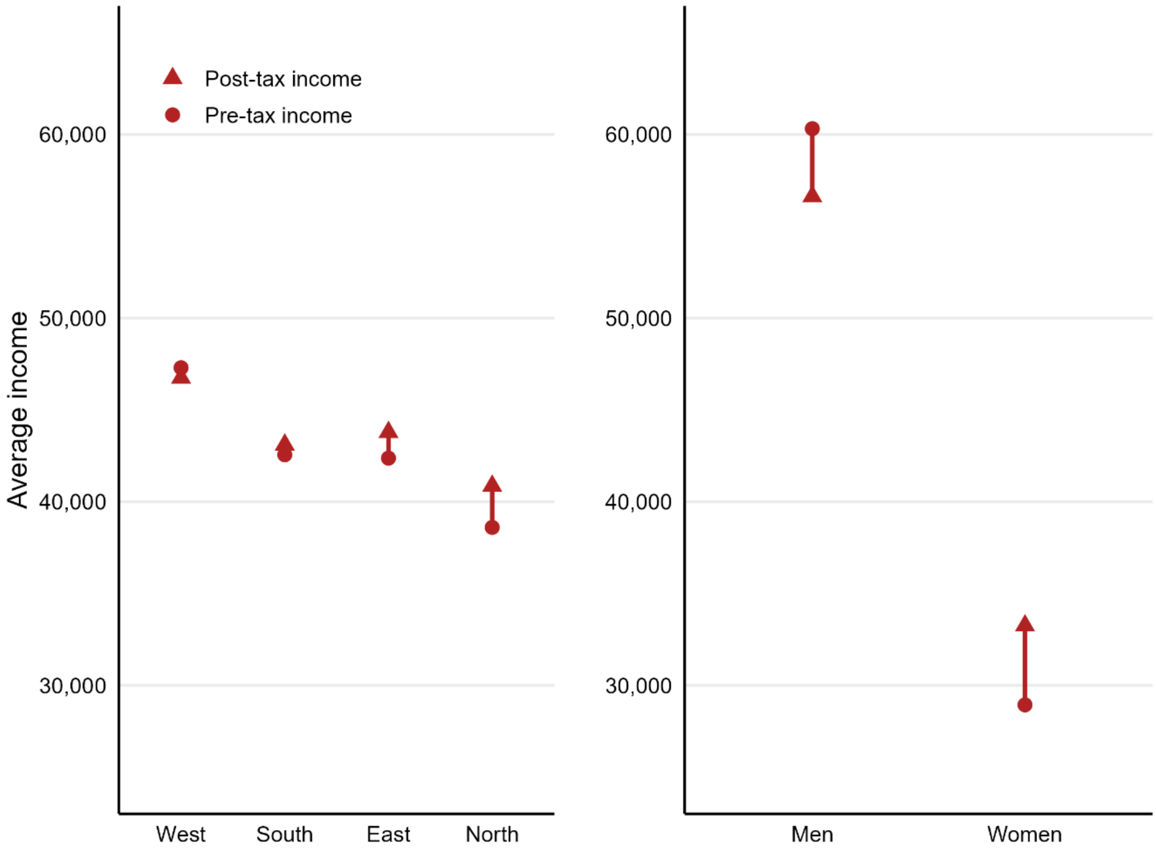
Note: This figure shows the share of pre-tax national income and post-tax national income accruing to different age groups in 2016. The unit of analysis is the individual adult and income is split equally among all adult members of a household.

We repeat this exercise for other dimensions such as region and gender in Figure 3.17. There is a growing interest in spatial inequality, as evidenced by the construction of regional statistics by the OECD (2022) and the multi-country *Linking National and Regional Inequality* project (Bauluz *et al.*, 2023). With individual-level data on residency, it is reasonably straightforward to construct *Distributional Regional Accounts*. Here, we show statistics at the NUTS1 level, but our data allows us to study inequality and redistribution across much finer geographic categories such as municipalities or ZIP codes. Our regional accounts have a number of advantages over traditional methods to analyse both between- and within-region inequality. First of all, we use a comprehensive income concept that includes not just labour income, but also distributed and undistributed profits. Importantly, these profits are assigned to the locations where a firm's shareholders live rather than to the location of production. This latter point is particularly relevant for highly localised production where the location of production and ownership are largely unrelated, such as resource extraction. We find that there is considerable geographic inequality in pre-tax income between NUTS1 regions, with an average of over 47,000 euros in the west of the Netherlands and less than 39,000 euros in the north.[58] This inequality is left largely unchanged by redistribution.

Finally, one of the most prominent dimensions of inequality is that of gender. A large body of research has documented a decline in the gender wage gap over much of the 20th century in many countries around the world (Blau and Kahn, 2017; Neef and Robilliard, 2021). In the last years, a lot of research has focused on the role of children in explaining this wage gap (see e.g., Kleven, Landais and Søgaard (2019) and Lundborg, Plug and Rasmussen (2017)). An important finding from this literature is that gender inequality in pre-tax labour income has been left largely unaffected by the expansion of family policies in the past 60 years (Kleven *et al.*, 2024). Our analysis allows us to look beyond pre-tax income and also consider the direct effect of redistribution on gender inequality. For this part of our analysis, we have to deviate from the usual choice of splitting resources equally among the adult members of households. Instead, we assign income, taxes and spending that can be individualised to the individual that receives or pays it and only split resources equally when they cannot. This approach unavoidably ignores redistribution that occurs within households. We find that government redistribution leads to a sizeable fall in the gender gap: the difference in the average income falls by a fifth, from 31,377 euros for pre-tax income to 23,370 euros for post-tax income.

[58] In Figure A.37 we show the flip side of this result by plotting the prevalence of the different regions for each income group.

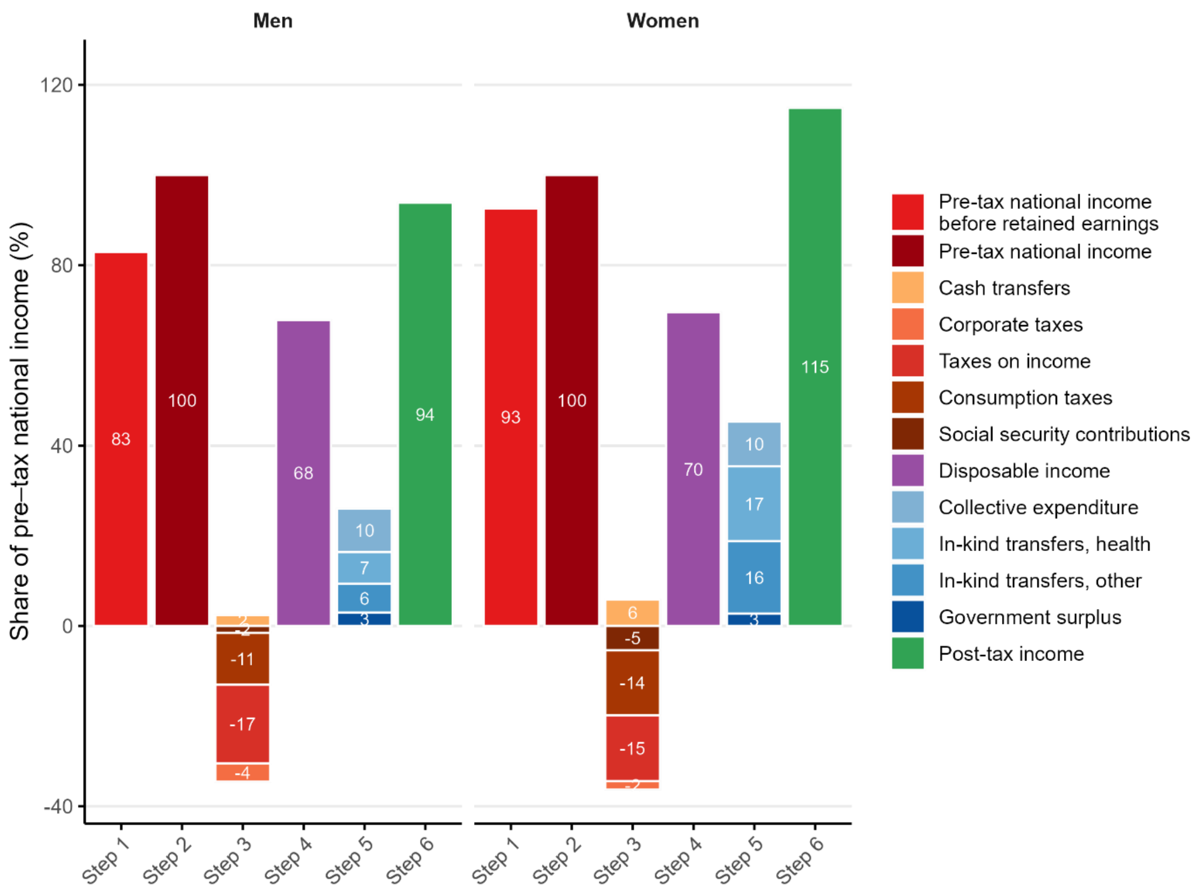
Figure 3.17: Redistribution across region and gender



Note: The left panel of this figure shows the average pre-tax national income and post-tax national income accruing to different regions in 2016. The unit of analysis is the individual adult and income is split equally among all adult members of a household. The right panel shows the average pre-tax national income and post-tax national income accruing to men and woman, respectively. The unit of analysis is the individual adult, but, exceptionally, income is assigned to the individual who nominally earns it.

In Figure 3.18, we show the gradual transition from pre-tax to post-tax income for men and women separately. In these figures, each income category is expressed as a share of the group's pre-tax national income. The combination of taxation and government spending result in posttax incomes that exceed pre-tax incomes for women, while the reverse is true for men. The tax burden when expressed as a percentage of pre-tax national income is similar for men and women, but cash and in-kind transfers represent a greater share of income for women. This is primarily the result of the fact that women's incomes tend to be lower, and transfers are targeted at those lower in the income distribution. Figure A.39 shows that conditional on income there are small differences in the amounts of transfers received by men and women, but these matter less than the fact that women's average pre-tax national income lies below that of men. In Figure A.40, we perform a similar analysis for geographical inequality and redistribution and find essentially no differences across regions in the generosity of government spending conditional on income.

Figure 3.18: Transition from pre-tax to post-tax income, by gender



Note: This figure illustrates the transition from pre-tax to post-tax income for men and women. Step 1 shows pre-tax income excluding retained earnings. In Step 2, retained earnings are included. Step 3 incorporates cash transfers and subtracts taxes and social security contributions, resulting in disposable income in Step 4. Step 5 adds collective expenditures, social transfers in kind, and the government surplus. The final outcome, in Step 6, is post-tax income.

3.6. Conclusion and Perspectives

This paper has sought to answer some of the most pressing questions in economic policy: how is income distributed, which social groups contribute to the government's revenues and which groups benefit from its spending? To answer these questions for the Netherlands, we have combined exceptionally comprehensive administrative datasets with household surveys and detailed macroeconomic data. The richness of the data has allowed us to critically review the importance of several crucial assumptions and quantify the uncertainty of inequality statistics. Our study reveals a number of interesting avenues for future research.

First, in today's world the ownership of financial assets is highly globalised. This has important implications both for the measurement of income as well as that of tax burdens, in particular at the very top of the distribution. Income that is retained by foreign firms abroad is mostly not captured by national data sources. To overcome this issue, researchers could exploit cross-border datasets, such as the OECD's Country-by-Country Reports that have already been used to study tax avoidance (Garcia-Bernardo, Janský and Tørsløv, 2021). These reports contain information on income and taxes paid by a limited set of very large firms, but do not provide information on smaller firms.

Second, we have provided a snapshot of income and redistribution, but one would ideally follow individuals over a longer period of time. In some cases, the generation of income and the payment of taxes or receipt of spending may not perfectly align. Average income across several years may be a more robust indicator of an individual's "ability to pay". Relatedly, corporate tax returns reveal a high prevalence of firms with business losses in any given year, even after adding back certain tax deductions. It is vital to study the extent to which these losses represent true economic losses rather than mere tax planning. This could lead to improvements to inequality statistics as well as to the national accounts.

Third, in this study, we have measured the redistributive impact of government spending by its cost value. A natural, but ambitious next step would be to study the causal effect that different types of government spending have on (future) pre-tax income. There is already an abundance of research studying the causal effects of (public) education (see e.g., Card (1999)), and to a lesser extent that of certain types of income support (Hoynes, Schanzenbach and Almond, 2016). As of yet, however, no effort has been undertaken to combine such estimates in a comprehensive analysis of the effects of government redistribution.

The distributional tax profiles presented in this study can be used by policy makers who pursue a specific degree of tax progressivity. We have documented the significance of the corporate tax at the very top of the income distribution. This underlines the importance for tax progressivity of current efforts undertaken by the OECD to impose a minimum tax on corporate profits, as well as of initiatives to similarly introduce minimum levels of taxation for billionaires. Still, today, most redistribution occurs through the spending rather than the tax side. This insight warrants more empirical as well as conceptual research into the precise distributive impact of different spending programs.

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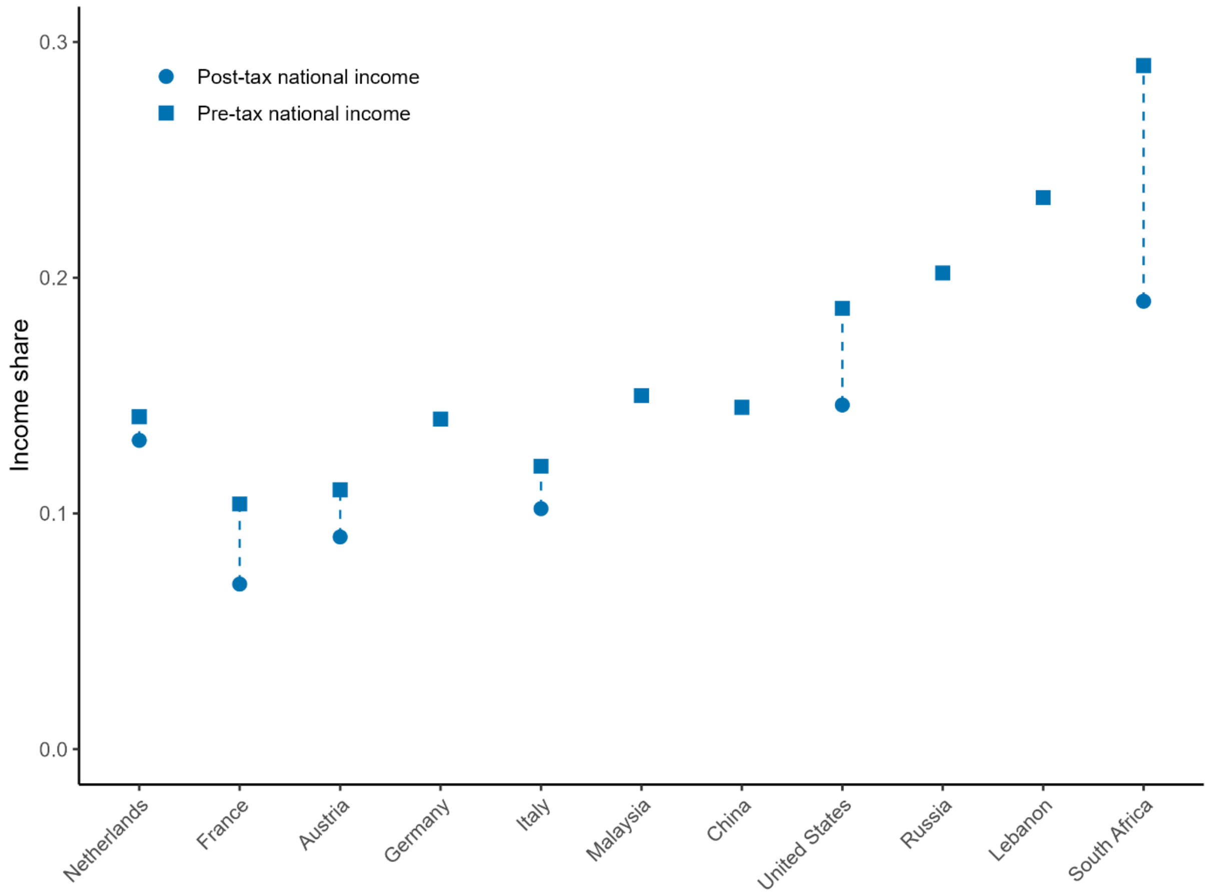
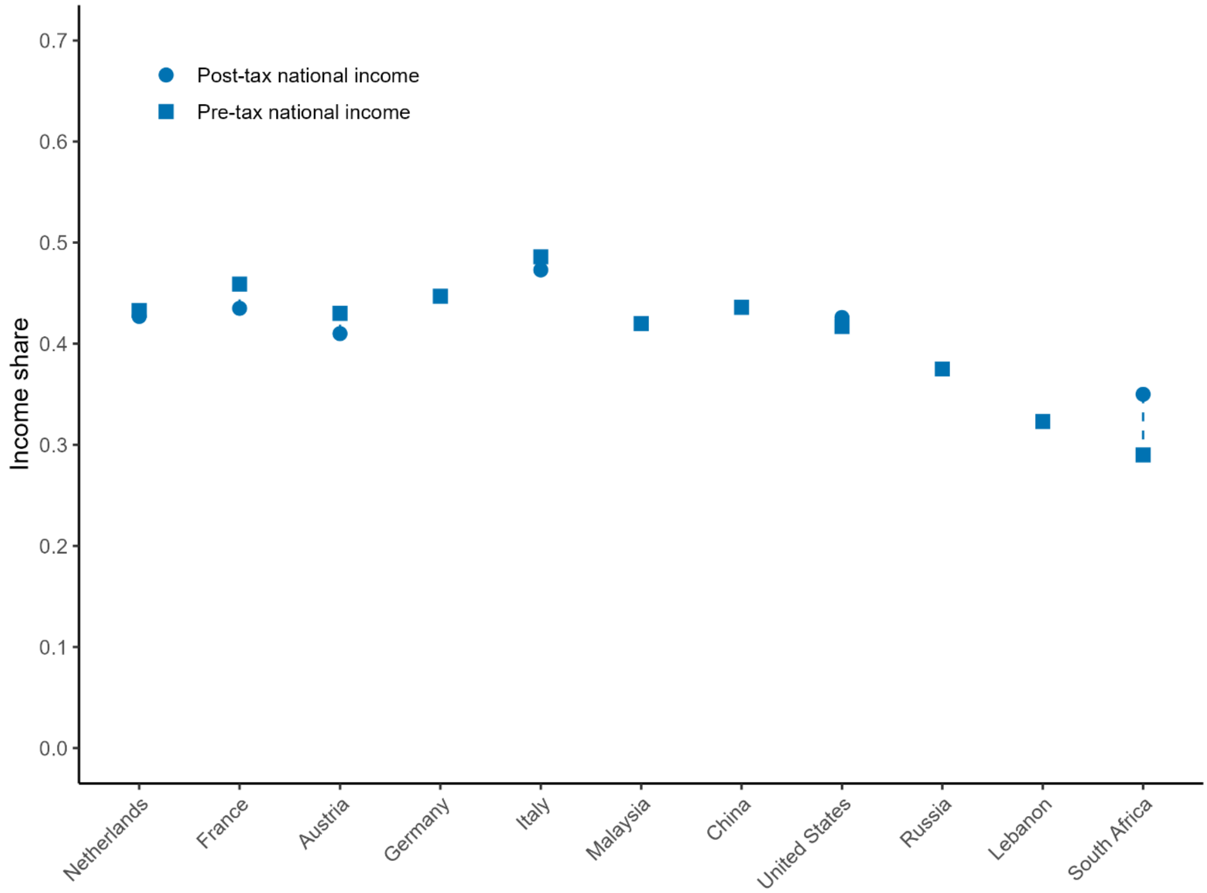
3.8. Appendix A Figures and Tables

Figure A.1: The share of income accruing to the top 1%



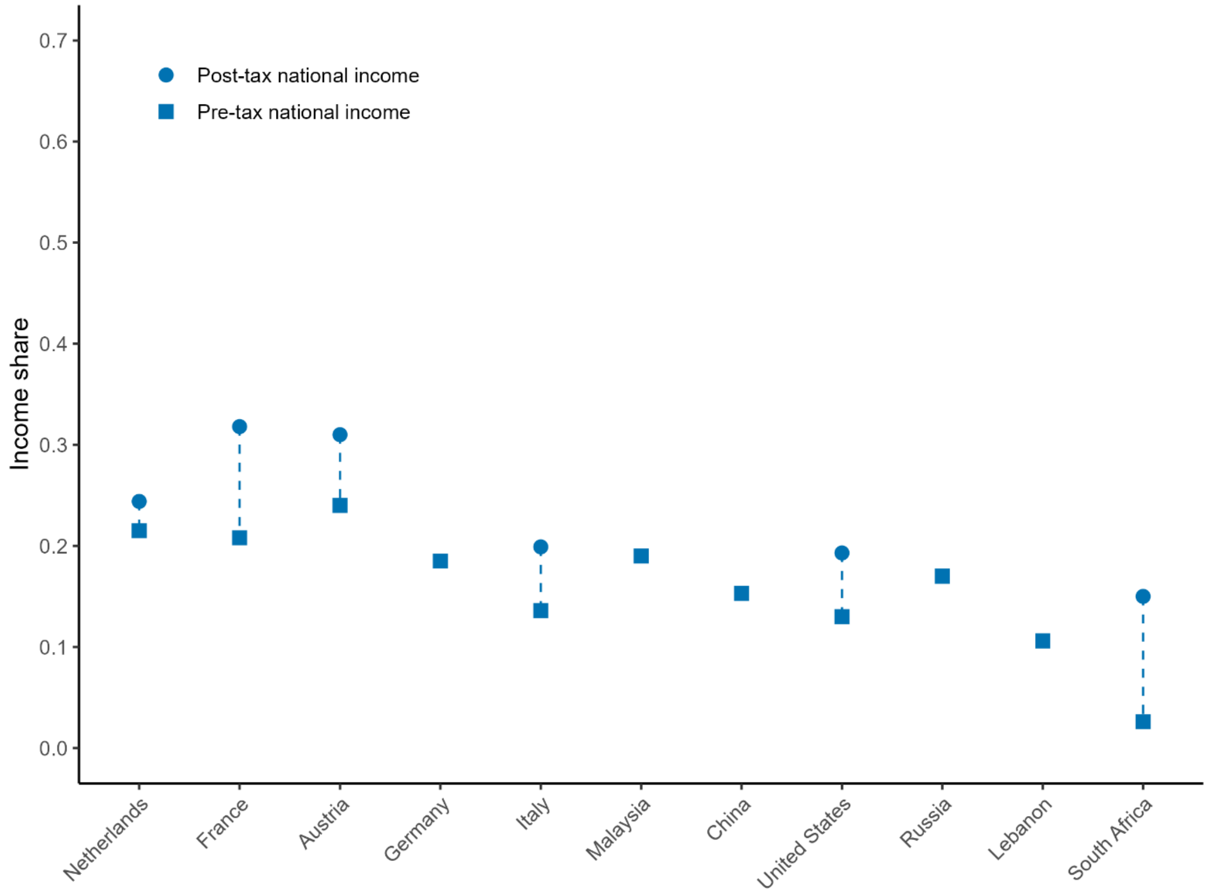
Note: This figure shows the share of pre-tax national income and post-tax national income accruing to the 1% income group, for a set of countries for which comparable estimates are available. We use our results for the Netherlands, Bozio *et al.* (2024) for France, Jestl and List (2022) for Austria, Bach, Bartels and Neef (2023) for Germany, Guzzardi *et al.* (2024) for Italy, Khalid and Yang (2021) for Malaysia, Piketty, Yang and Zucman (2019) for China, Piketty, Saez and Zucman (2018) for the US, Novokmet, Piketty and Zucman (2018) for Russia, Assouad (2023) for Lebanon and Chatterjee, Czajka and Gethin (2023) for South Africa.

Figure A.2: The share of income accruing to the middle 40%



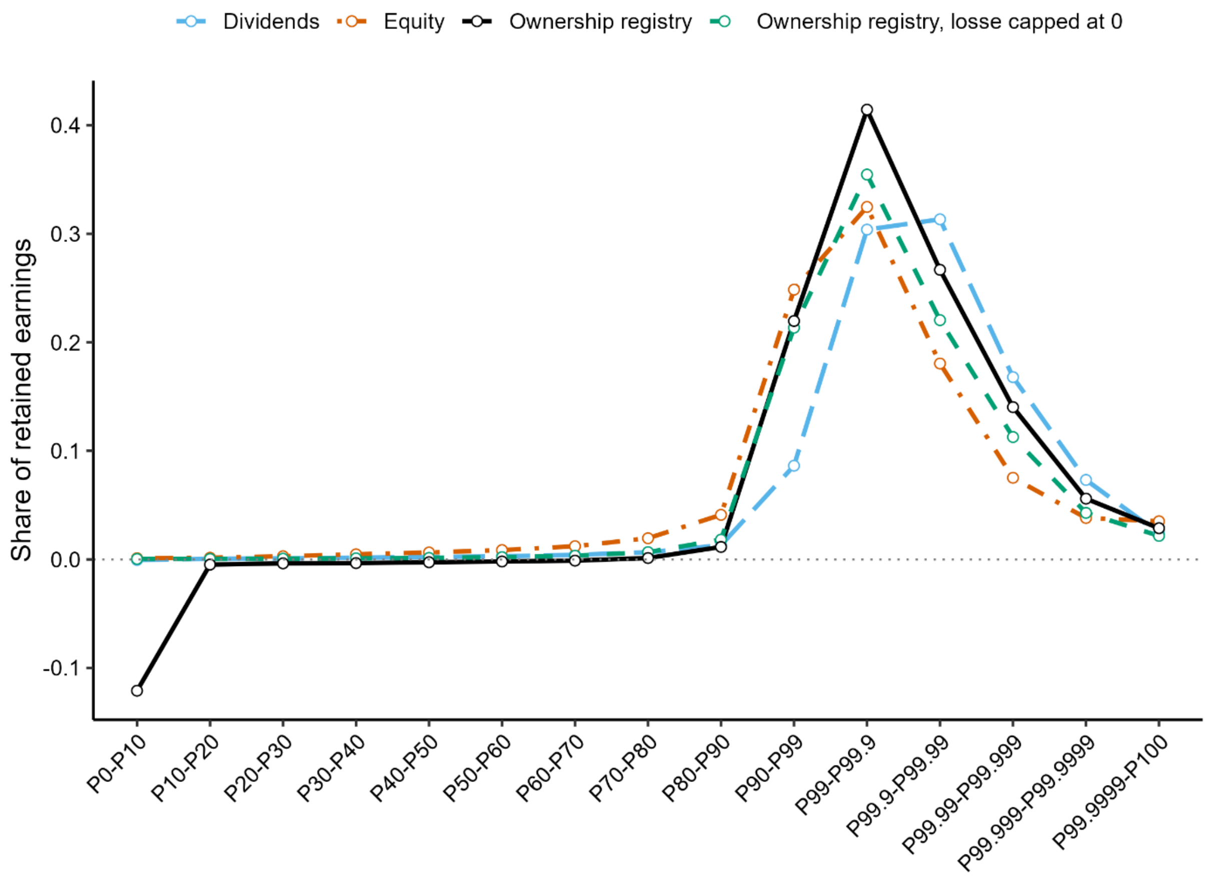
Note: This figure shows the share of pre-tax national income and post-tax national income accruing to the P50-P90% income group, for a set of countries for which comparable estimates are available. We use our results for the Netherlands, Bozio *et al.* (2024) for France, Jestl and List (2022) for Austria, Bach, Bartels and Neef (2023) for Germany, Guzzardi *et al.* (2024) for Italy, Khalid and Yang (2021) for Malaysia, Piketty, Yang and Zucman (2019) for China, Piketty, Saez and Zucman (2018) for the US, Novokmet, Piketty and Zucman (2018) for Russia, Assouad (2023) for Lebanon and Chatterjee, Czajka and Gethin (2023) for South Africa.

Figure A.3: The share of income accruing to the bottom 50%



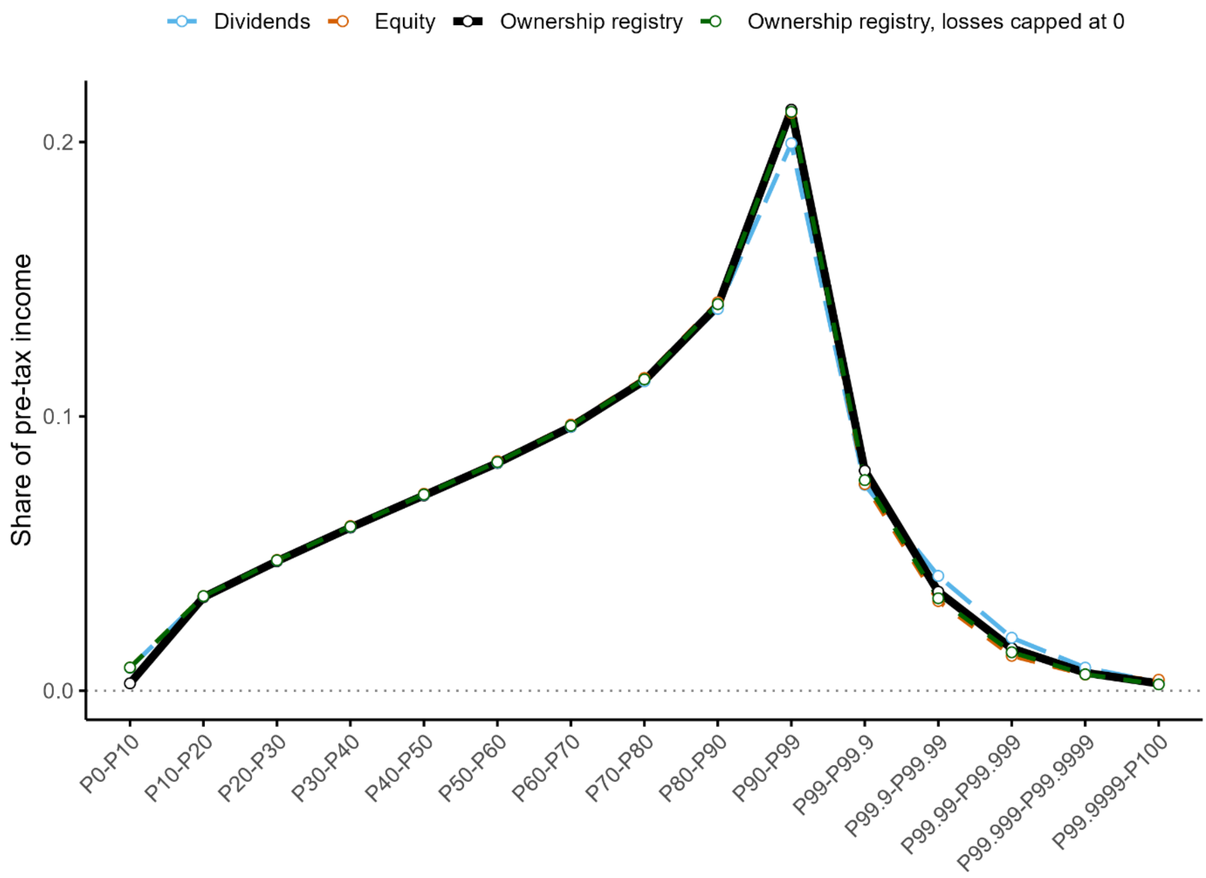
Note: This figure shows the share of pre-tax national income and post-tax national income accruing to the bottom 50% income group, for a set of countries for which comparable estimates are available. We use our results for the Netherlands, Bozio *et al.* (2024) for France, Jestl and List (2022) for Austria, Bach, Bartels and Neef (2023) for Germany, Guzzardi *et al.* (2024) for Italy, Khalid and Yang (2021) for Malaysia, Piketty, Yang and Zucman (2019) for China, Piketty, Saez and Zucman (2018) for the US, Novokmet, Piketty and Zucman (2018) for Russia, Assouad (2023) for Lebanon and Chatterjee, Czajka and Gethin (2023) for South Africa.

Figure A.4: The distribution of retained earnings under different allocation methods



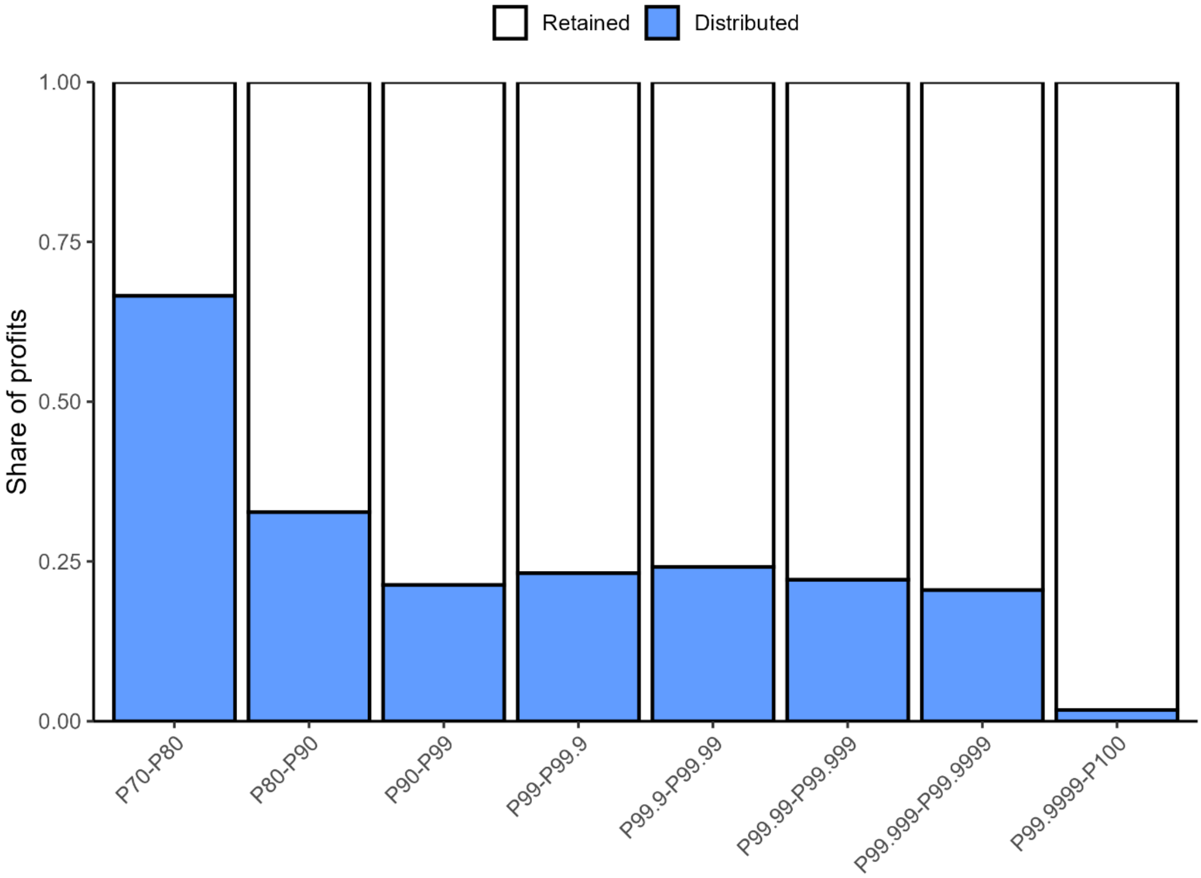
Note: This figure presents the distribution of retained earnings. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. Specifically, retained earnings are summed by each income group and then divided by total retained earnings.

Figure A.5: The distribution of pre-tax income under different assumptions



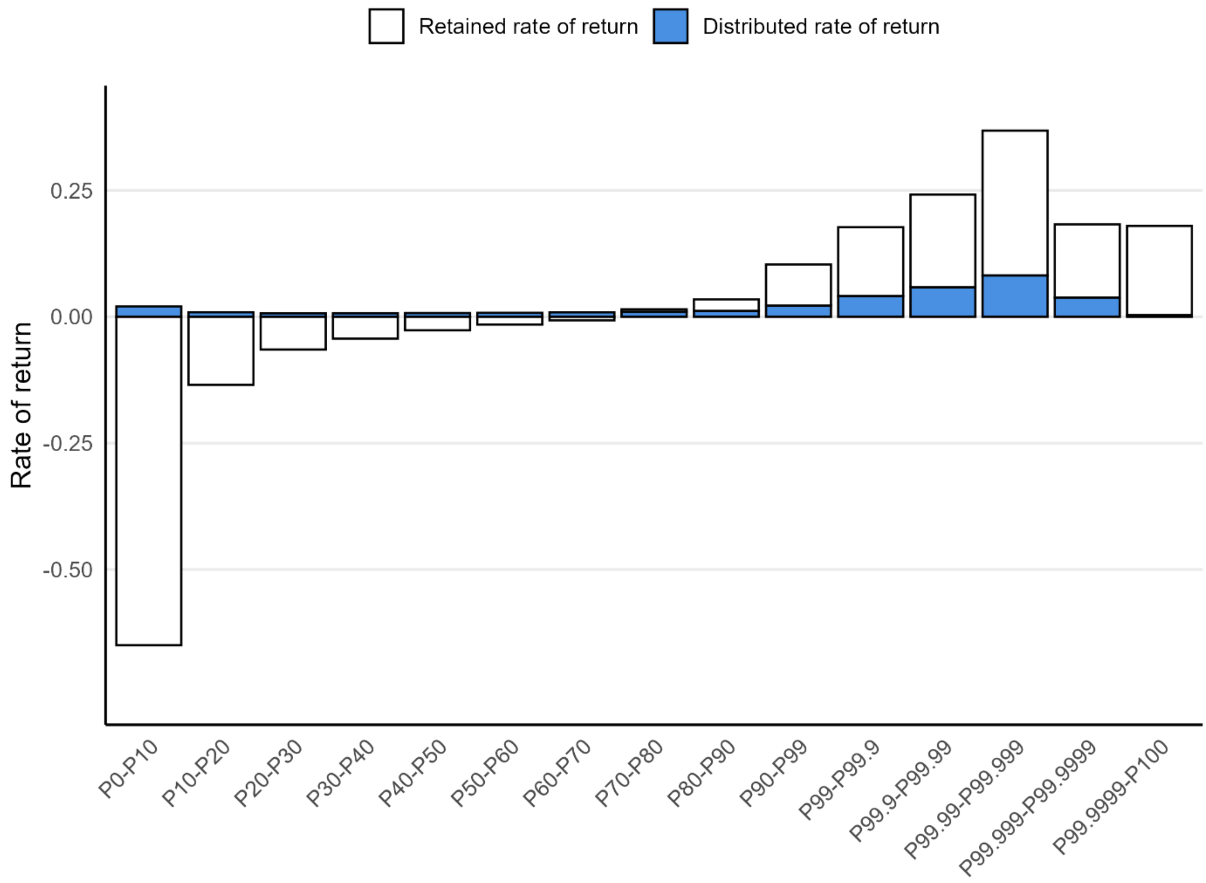
Note: This figure shows the share of pre-tax national income income accruing to each income group under different assumptions regarding the distribution of retained earnings. The blue line presents our main estimate using ownership registries, and the red and black lines present alternative distribution assumptions based on equity held and dividends distributed.

Figure A.6: The share of profits retained and distributed



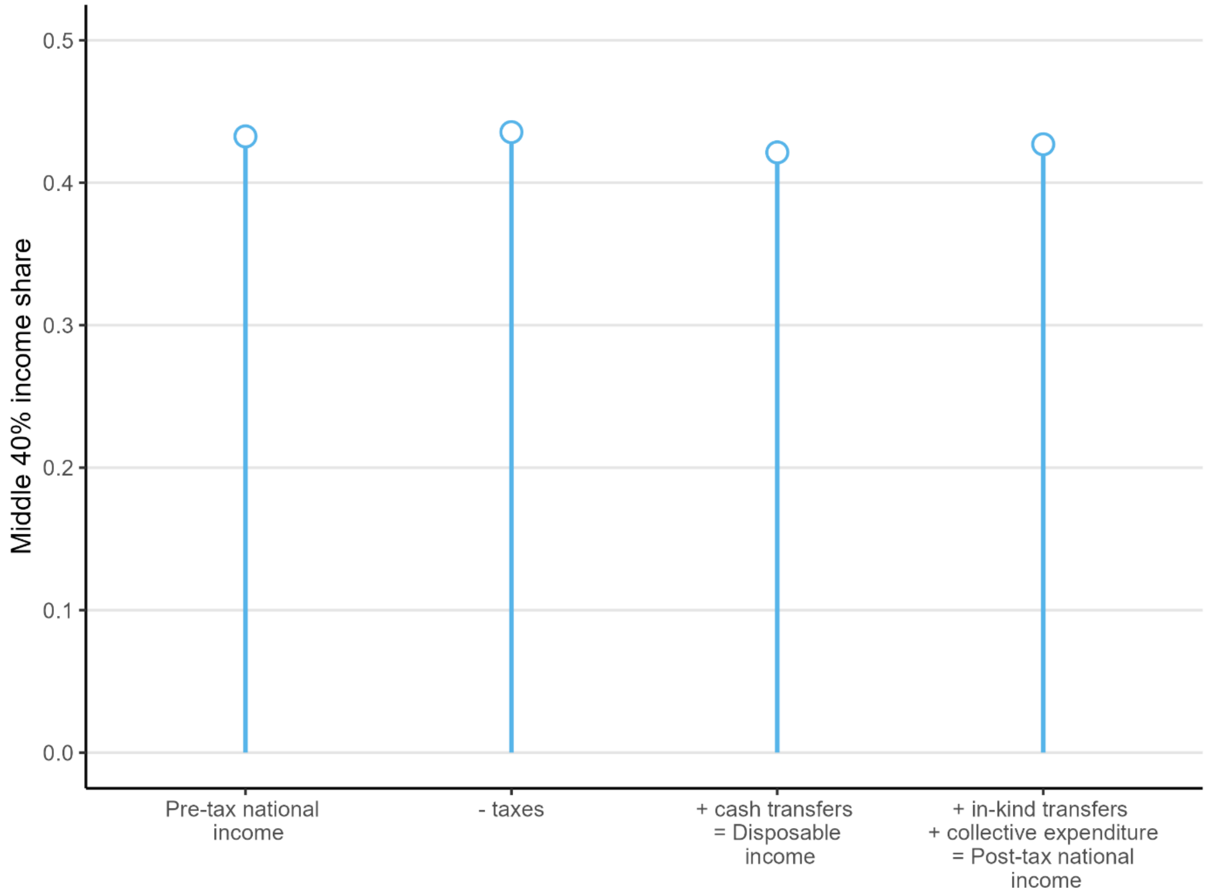
Note: This figure shows the share of profits of closely-held corporations that is distributed as dividends and that is retained within the firm for different income groups in 2016. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income.

Figure A.7: The rate of return on equity by income group



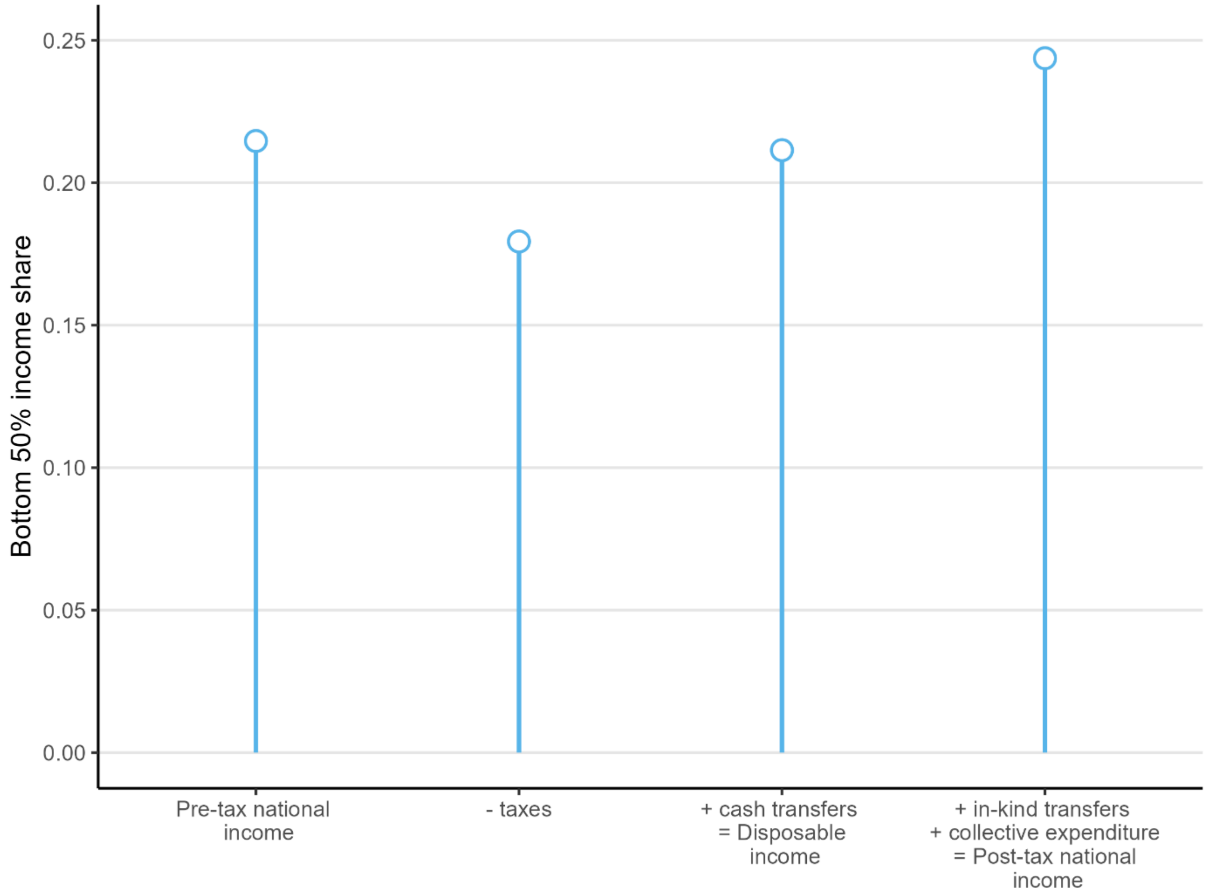
Note: This figure shows profits of closely-held corporations expressed as a percentage of corporate equity for different income groups in 2016. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income.

Figure A.8: Middle 40% income share under different income concepts



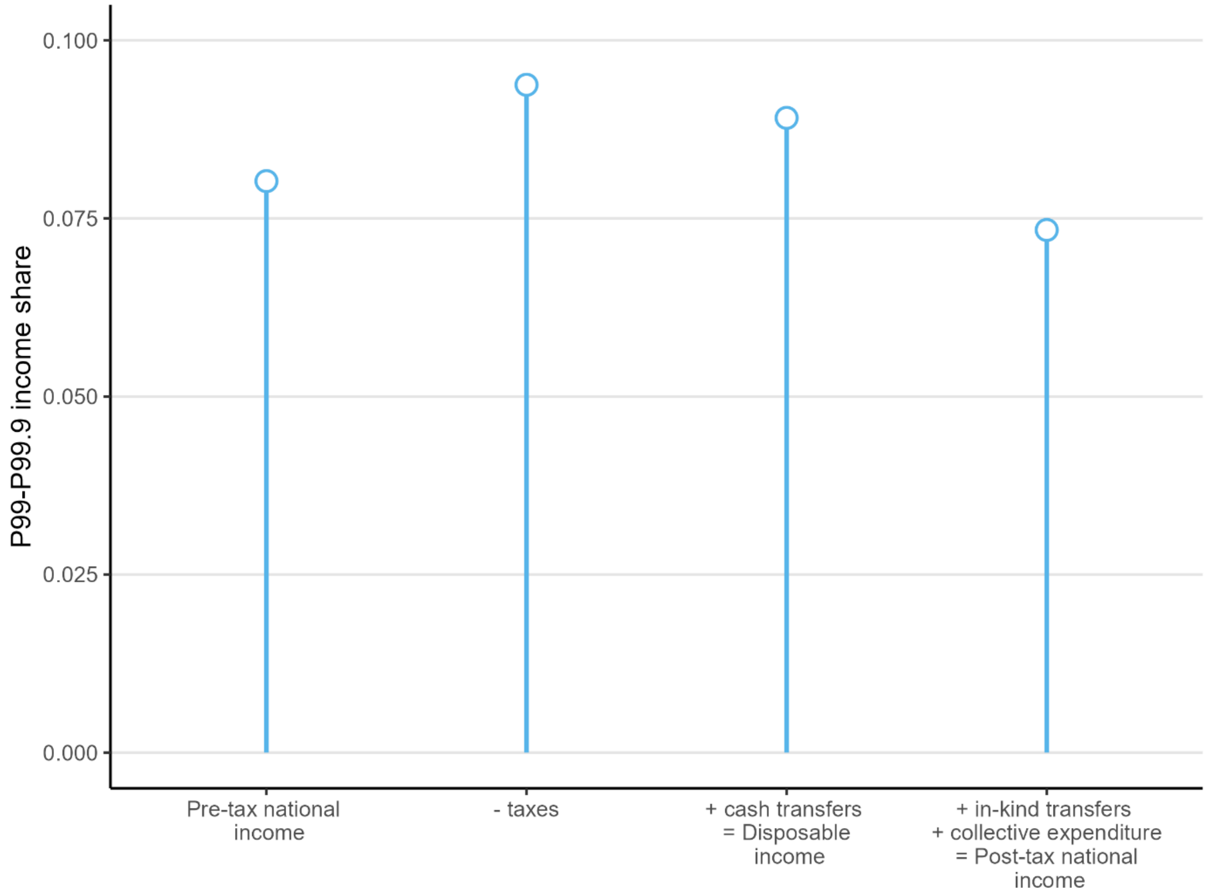
Note: This figure presents the middle 40% share of income under different income concepts. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by either pre-tax national income, pre-tax national income net of taxes, disposable income, or post-tax national income.

Figure A.9: Bottom 50% income share under different income concepts



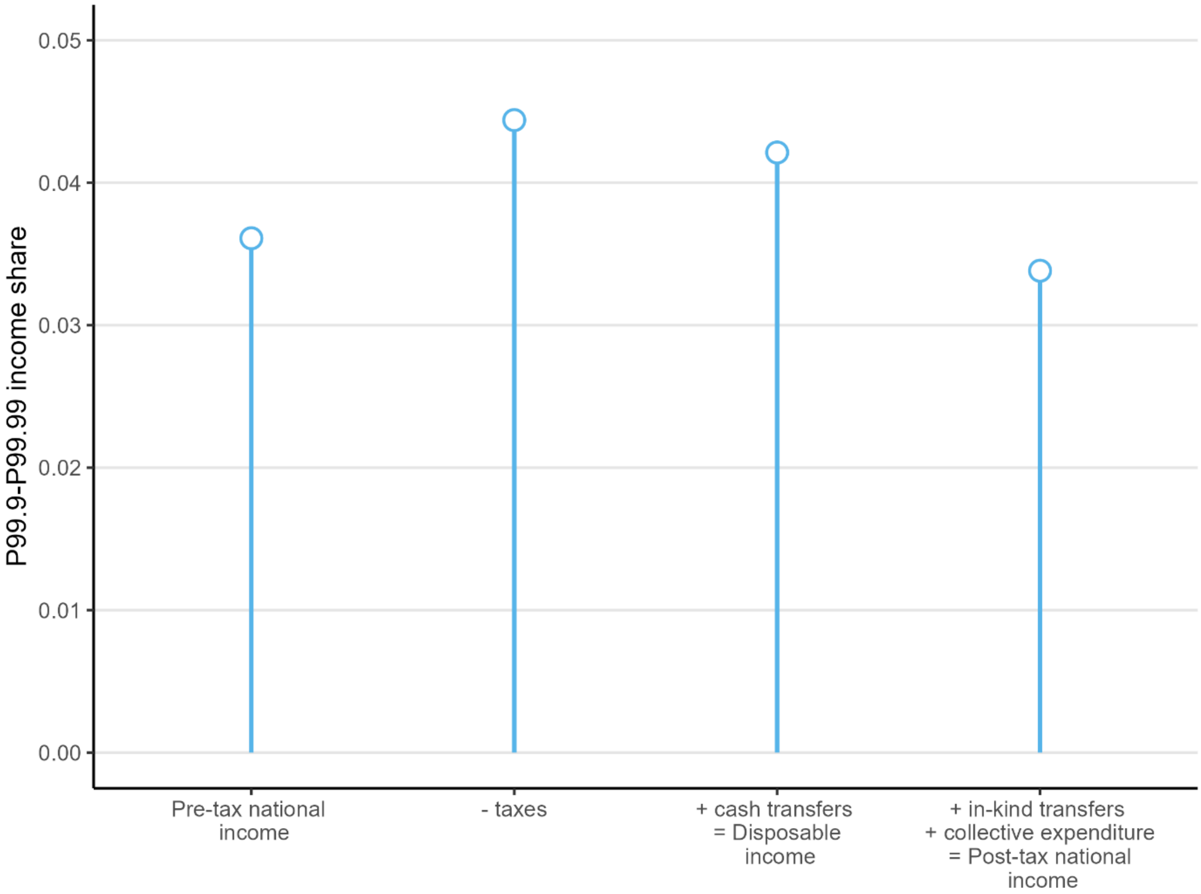
Note: This figure presents the bottom 50% share of income under different income concepts. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by either pre-tax national income, pre-tax national income net of taxes, disposable income, or post-tax national income.

Figure A.10: P99-P99.9 income share under different income concepts



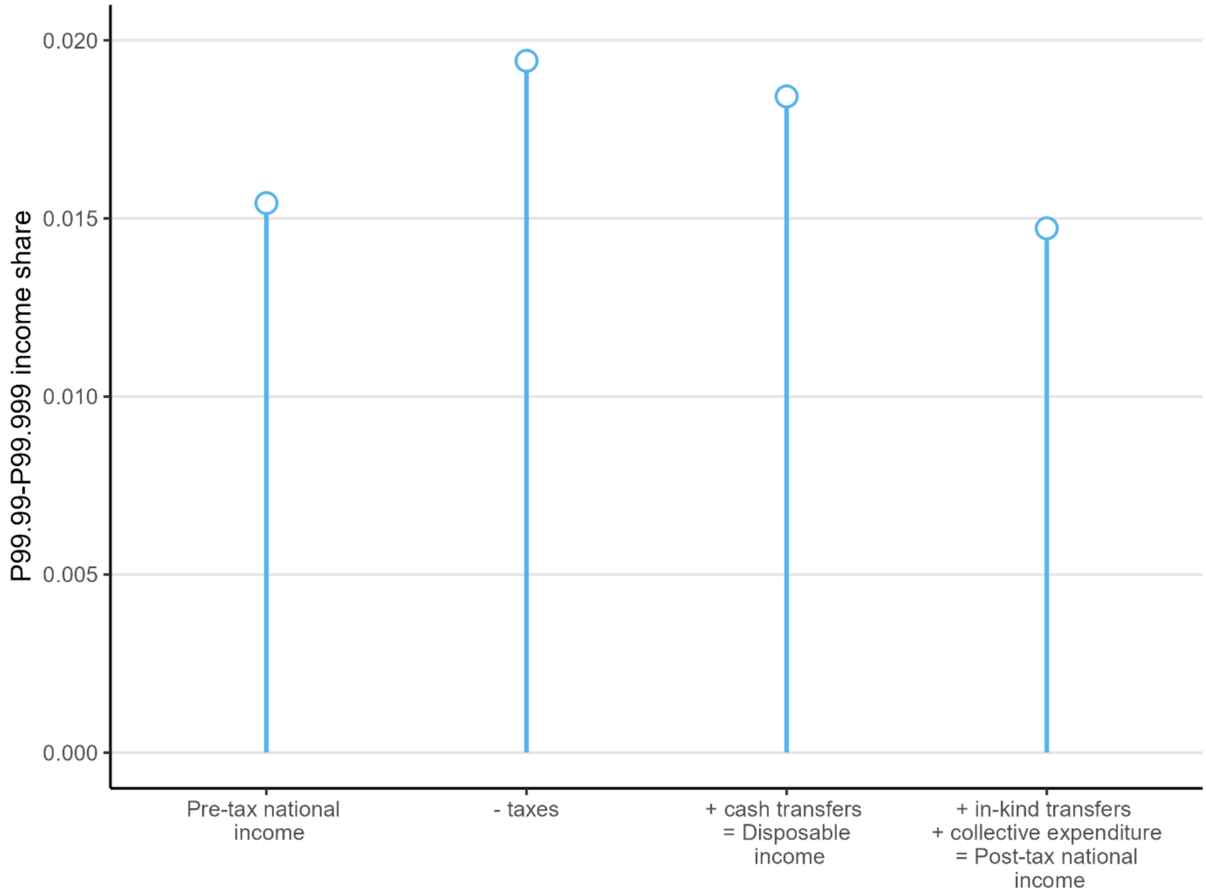
Note: This figure presents the P99-P99.9 share of income under different income concepts. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by either pre-tax national income, pre-tax national income net of taxes, disposable income, or post-tax national income.

Figure A.11: P99.9-P99.99 income share under different income concepts



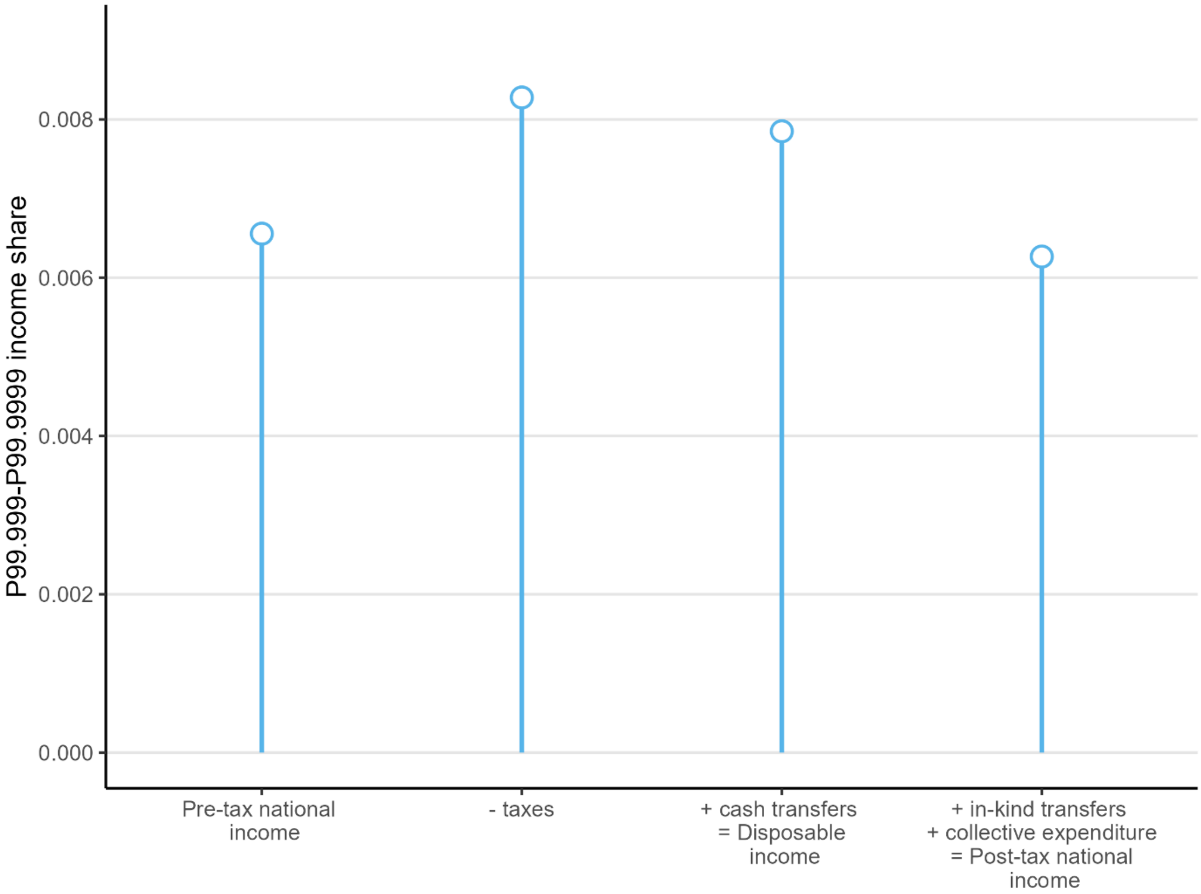
Note: This figure presents the P99.9-P99.99 share of income under different income concepts. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by either pre-tax national income, pre-tax national income net of taxes, disposable income, or post-tax national income.

Figure A.12: P99.99-P99.999 income share under different income concepts



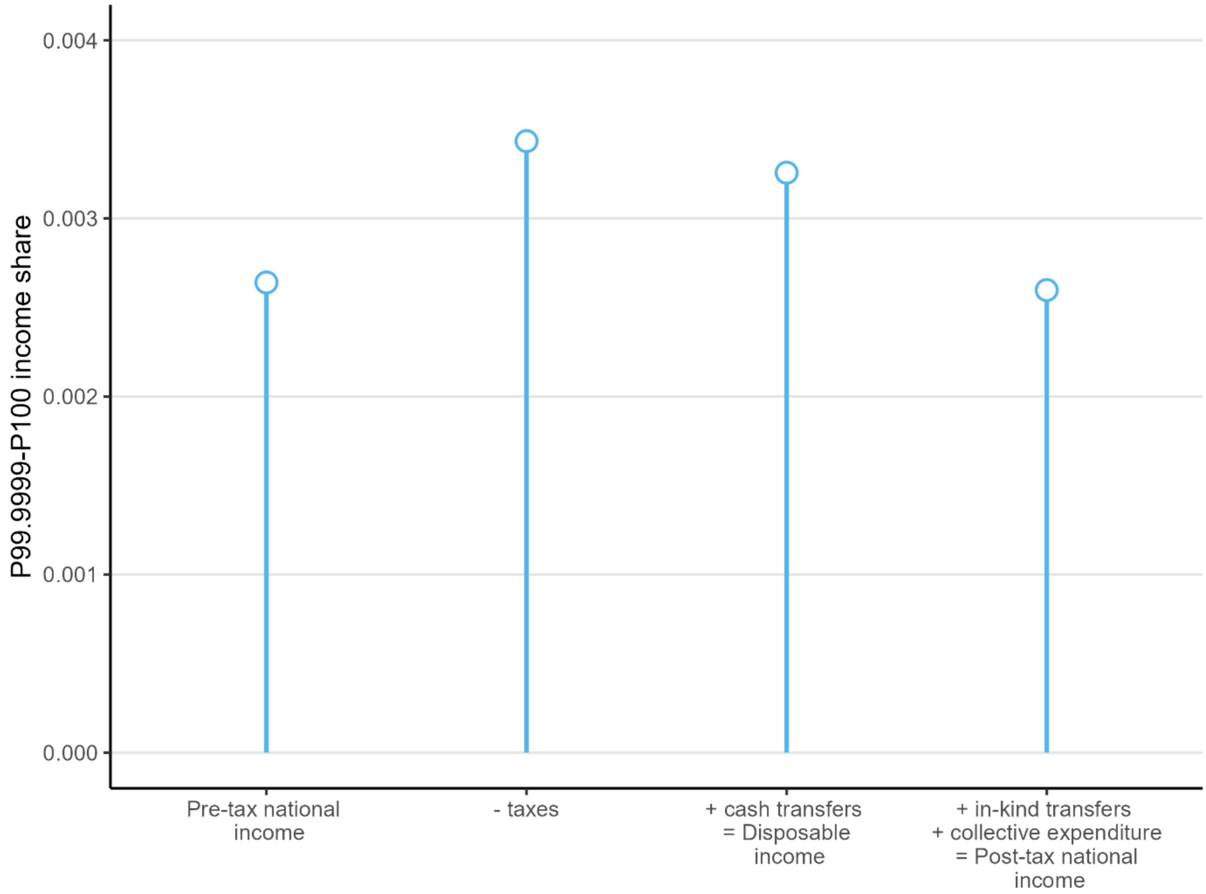
Note: This figure presents the P99.99-P99.999 share of income under different income concepts. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by either pre-tax national income, pre-tax national income net of taxes, disposable income, or post-tax national income.

Figure A.13: P99.999-P99.9999 income share under different income concepts



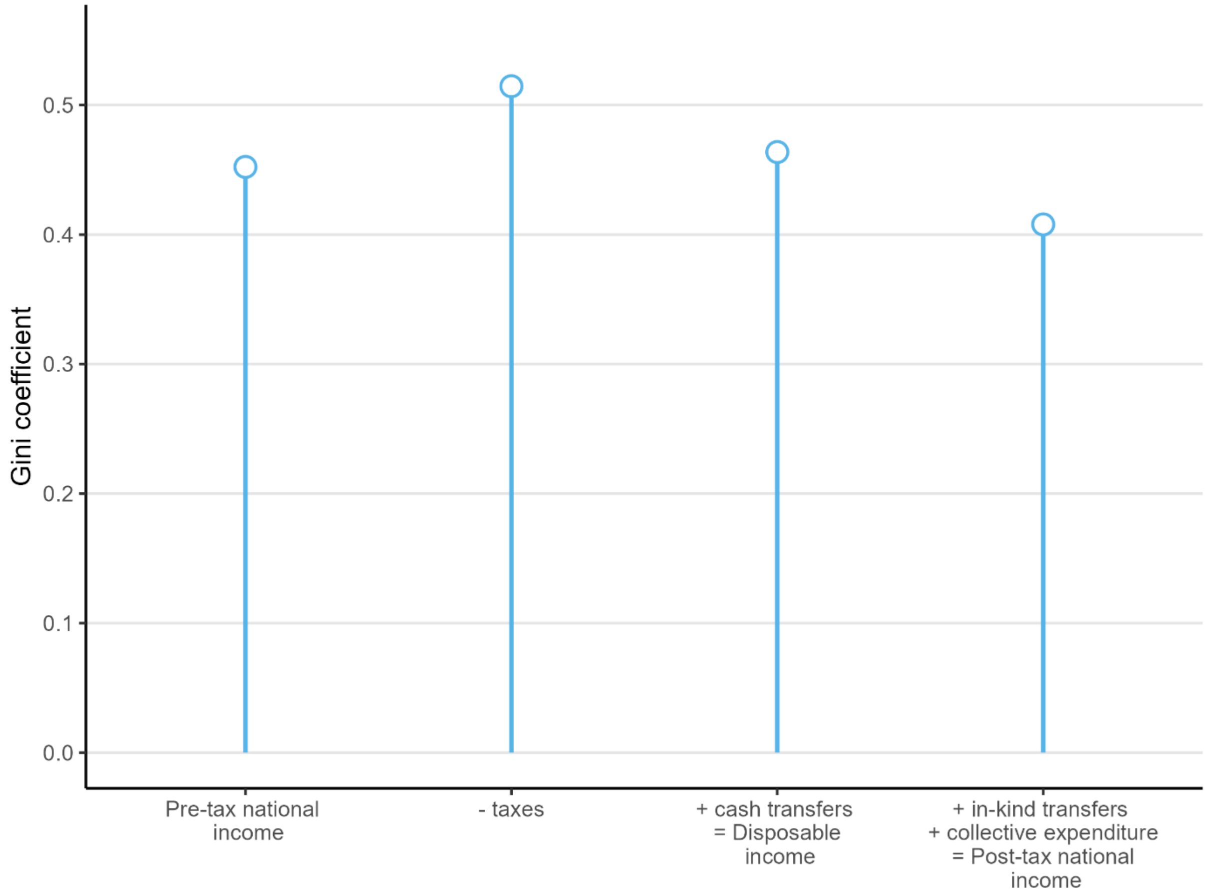
Note: This figure presents the P99.999-P99.999 share of income under different income concepts. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by either pre-tax national income, pre-tax national income net of taxes, disposable income, or post-tax national income.

Figure A.14: P99.9999-P100 income share under different income concepts



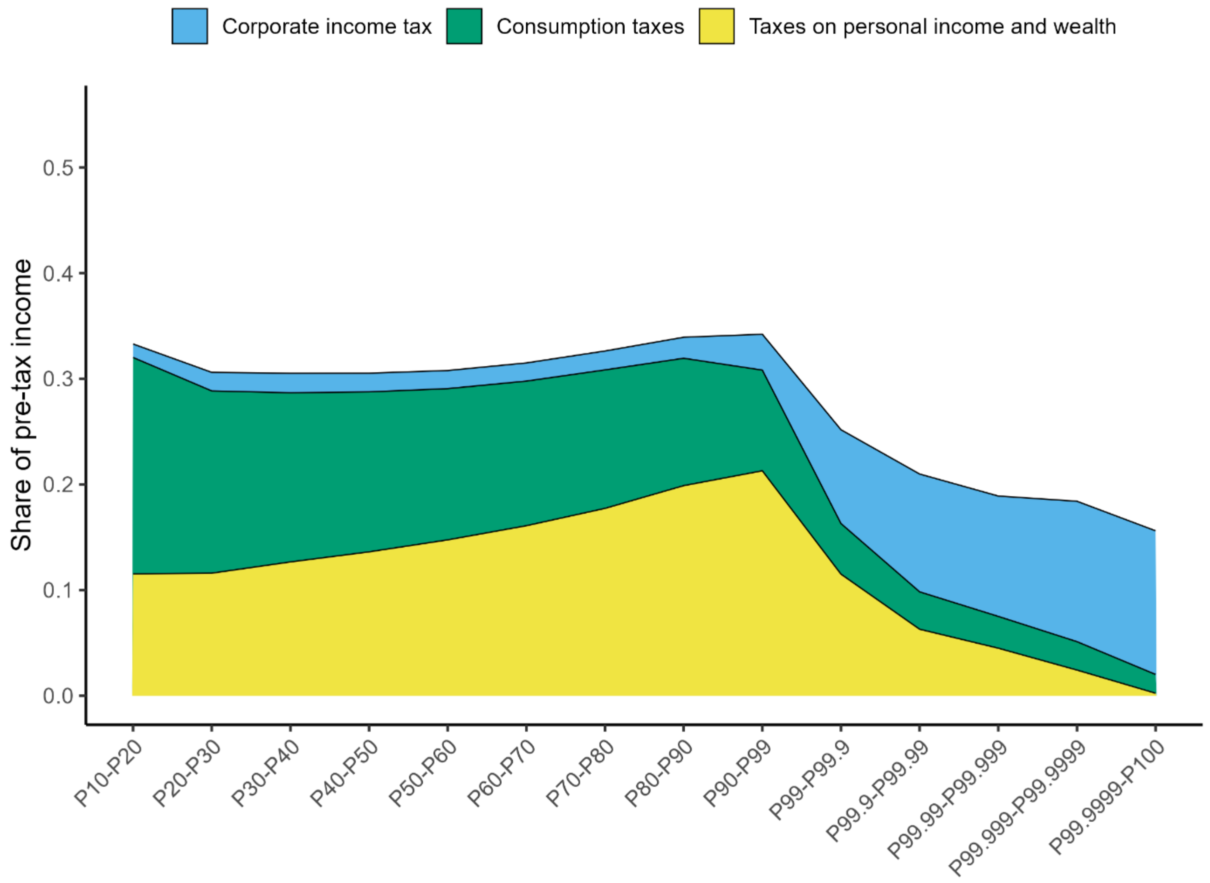
Note: This figure presents the P99.9999-P100 share of income under different income concepts. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by either pre-tax national income, pre-tax national income net of taxes, disposable income, or post-tax national income.

Figure A.15: Overall redistribution: The Gini coefficient for different income concepts



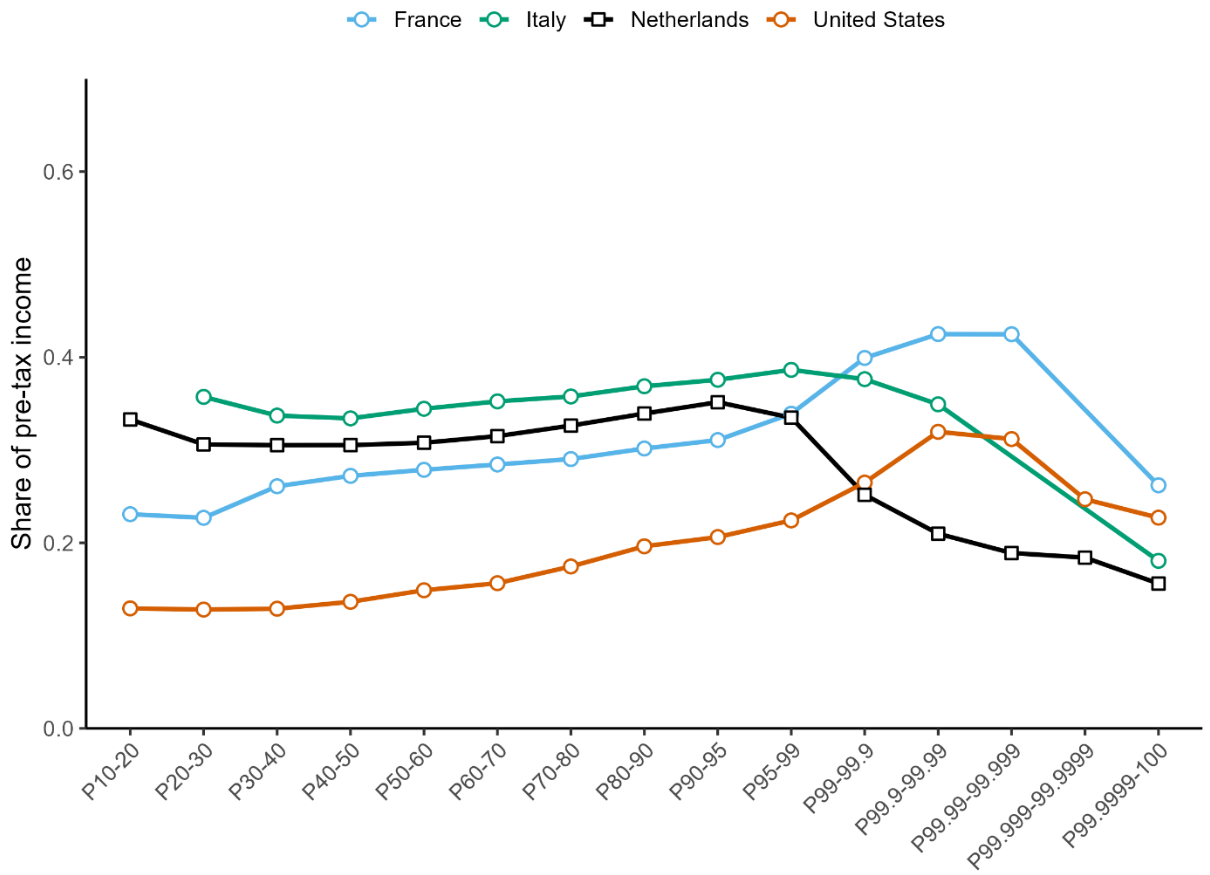
Note: This figure presents the Gini coefficient of income under different income concepts. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by either pre-tax national income, pre-tax national income net of taxes, disposable income, or post-tax national income.

Figure A.16: The effective tax rate by tax type, excluding payroll taxes



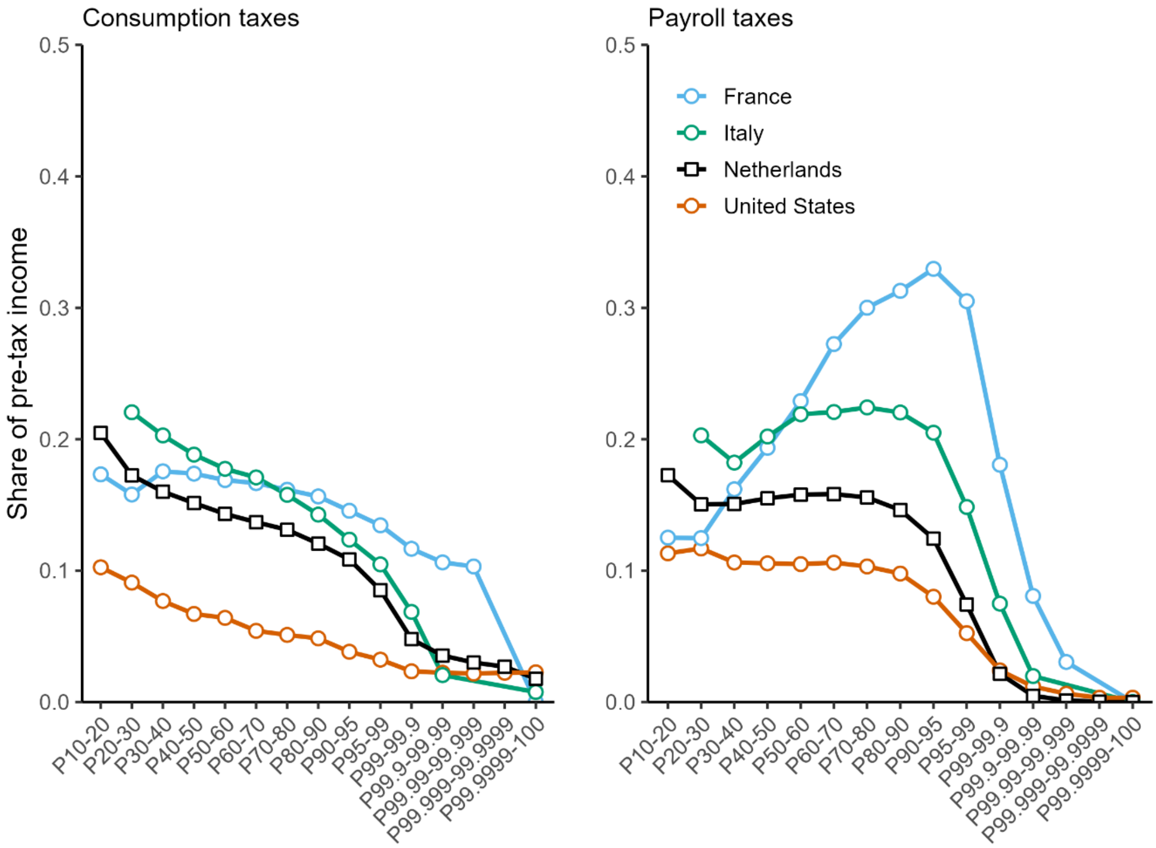
Note: This figure shows the effective tax rate faced by each income group in the Netherlands in 2016, decomposed by type of tax, excluding social insurance contributions. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. The effective tax rate is obtained by adding up all taxes paid by each income group and dividing by the pre-tax national income of that group.

Figure A.17: The effective tax rate by tax type excluding social insurance contributions in the Netherlands, Italy, France and the United States



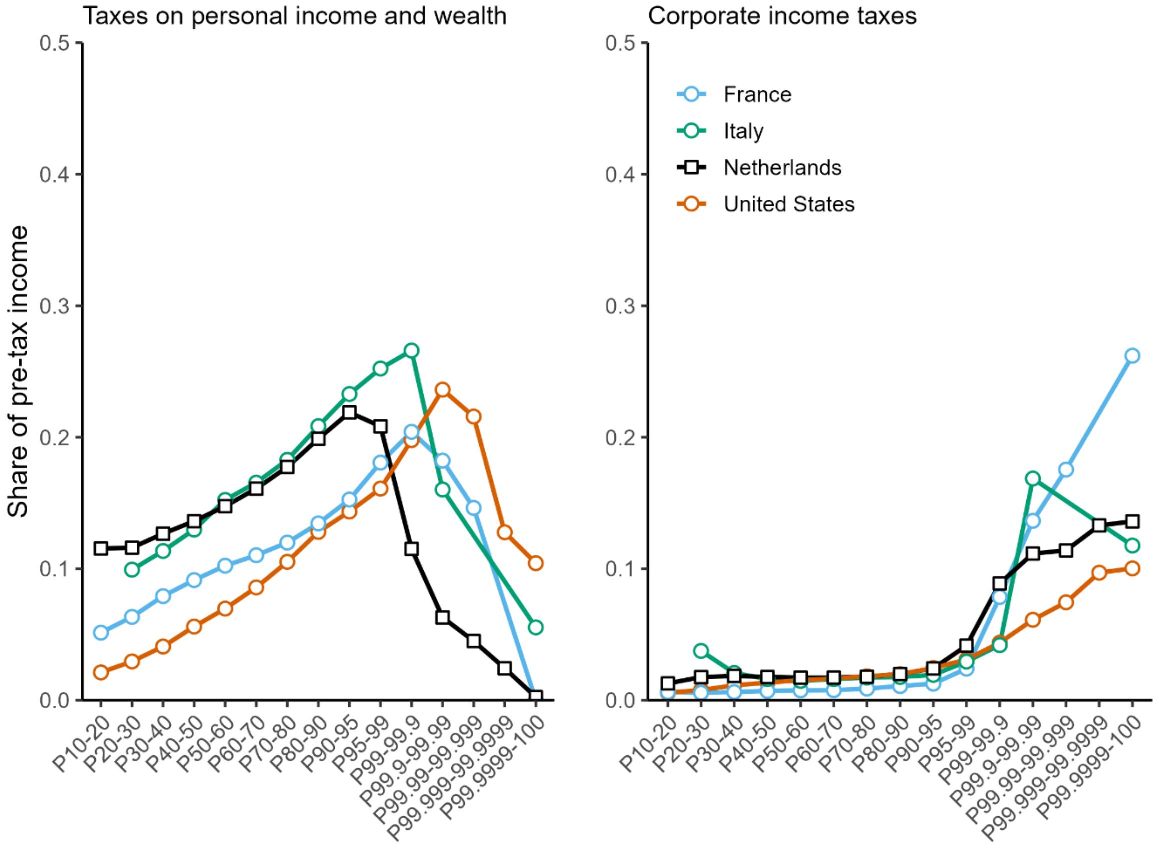
Note: This figure shows the effective tax rate faced by each income group in the Netherlands in 2016, and a number of countries for which comparable estimates are available. This figure equals figure 7, but excludes payroll taxes. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. For Italy, we use the 2015 profile from Guzzardi *et al.* (2024); for France, we use the 2018 profile from Bozio *et al.* (2024); for the United States, we use the 2018 profile from Saez and Zucman (2019). For the top group in France, we rely on a recent estimate by Bach *et al.* (2023). For the top group in Italy, we rely on an estimate shared with us by Demetrio Guzzardi which intends to reflect the effective tax rate faced by the late billionaire and politician Silvio Berlusconi.

Figure A.18: The effective consumption and payroll tax rate in the Netherlands, Italy, France and the United States



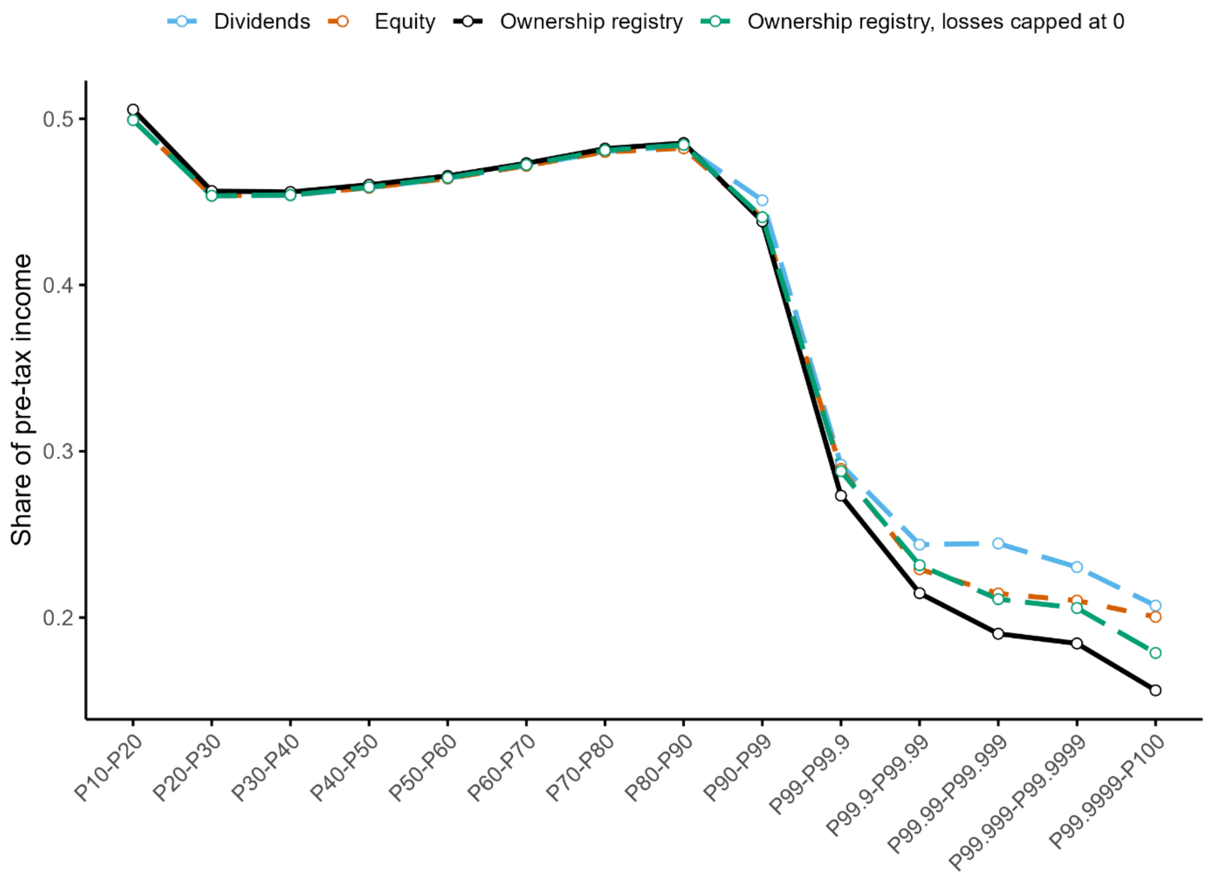
Note: This figure shows the effective tax rate faced by each income group in the Netherlands, Italy, France and the United States, for consumption and payroll taxes. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. The left panel shows the sum of consumption taxes as a percentage of pre-tax national income for each income group. The right panel does the same, but for payroll taxes.

Figure A.19: The effective corporate and personal income tax rate in the Netherlands, Italy, France and the United States



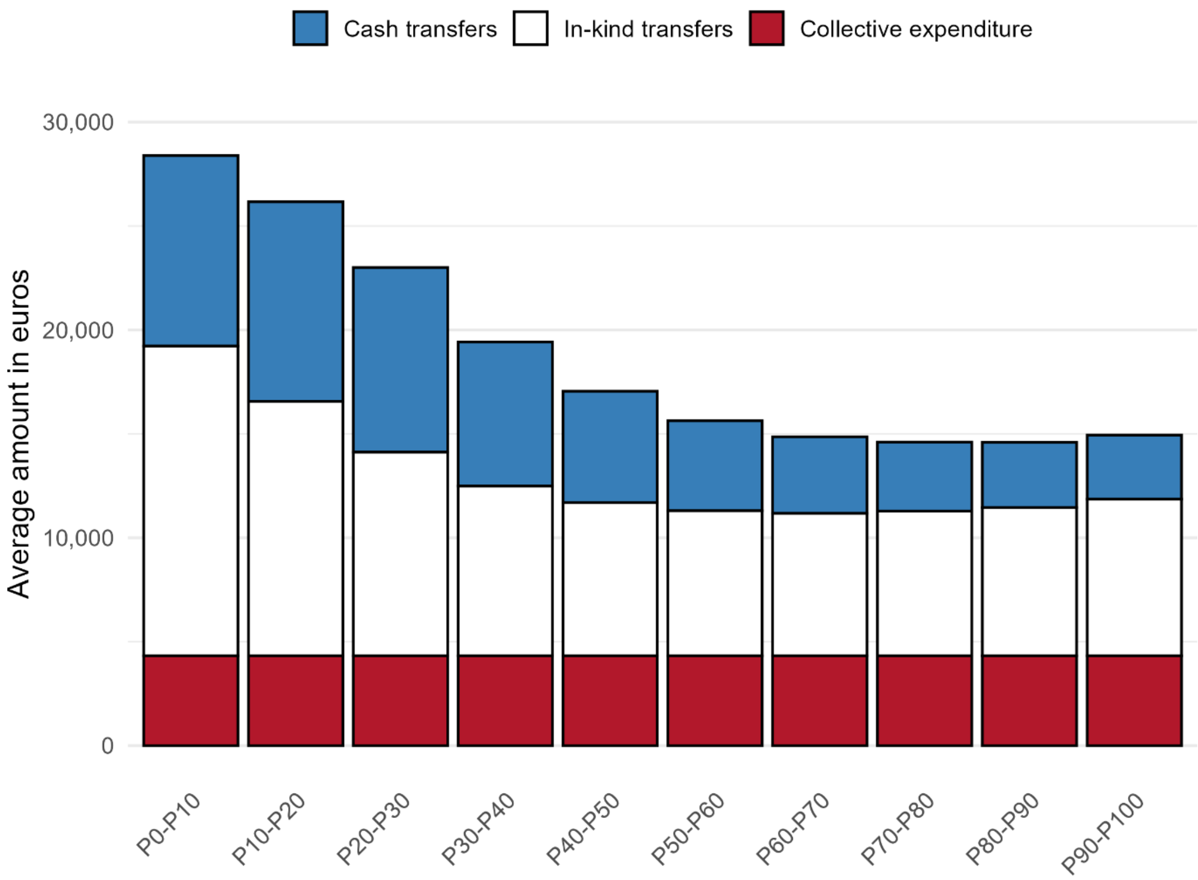
Note: This figure shows the effective tax rate faced by each income group in the Netherlands, Italy, France and the United States, for corporate income taxes and taxes on income and wealth. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. The left panel shows the sum of taxes on income and wealth as a percentage of pre-tax national income for each income group. The right panel does the same, but for corporate income taxes.

Figure A.20: The effective tax rate under different assumptions



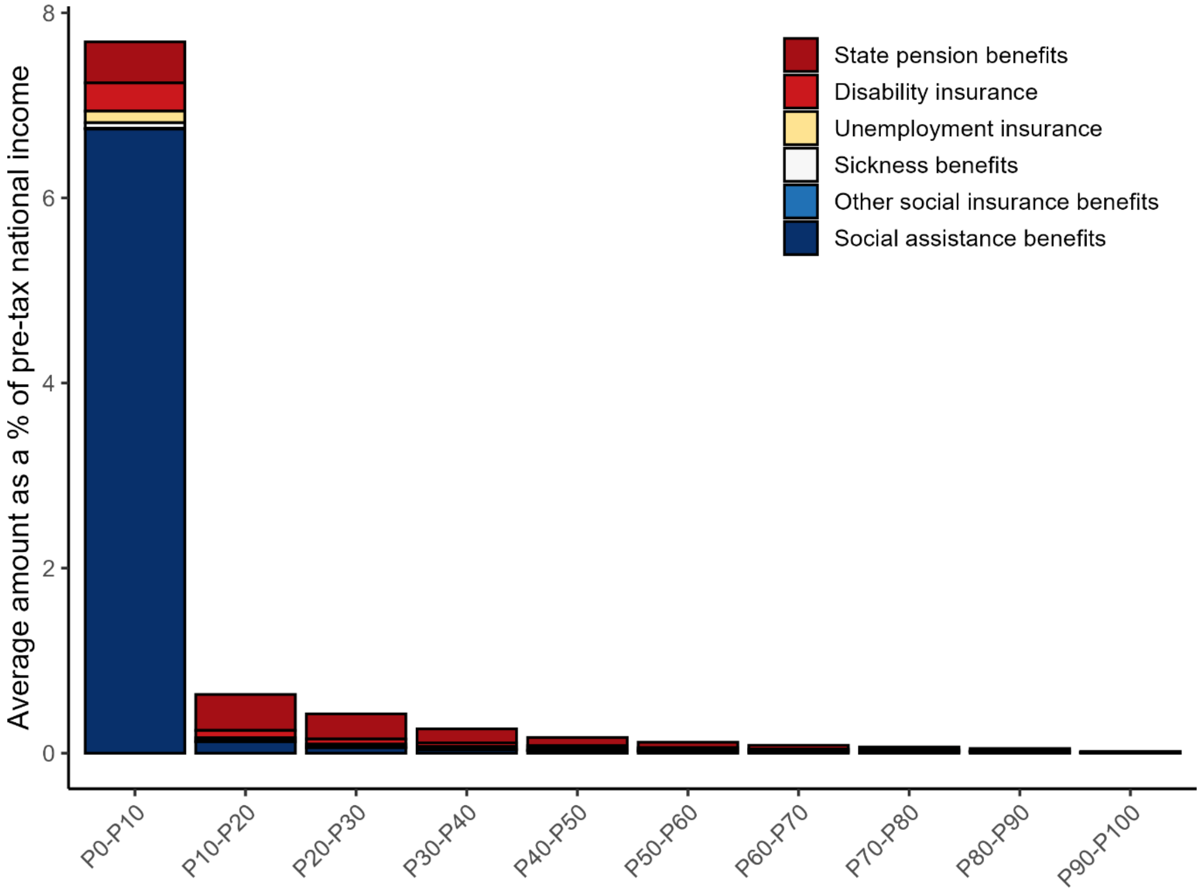
Note: This figure shows the effective tax rate faced by each income group in the Netherlands in 2016, under different distribution assumption regarding retained earnings. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. The effective tax rate is obtained by adding up all taxes paid by each income group and dividing by the pre-tax national income of that group.

Figure A.21: The average amount of government spending received by each income group



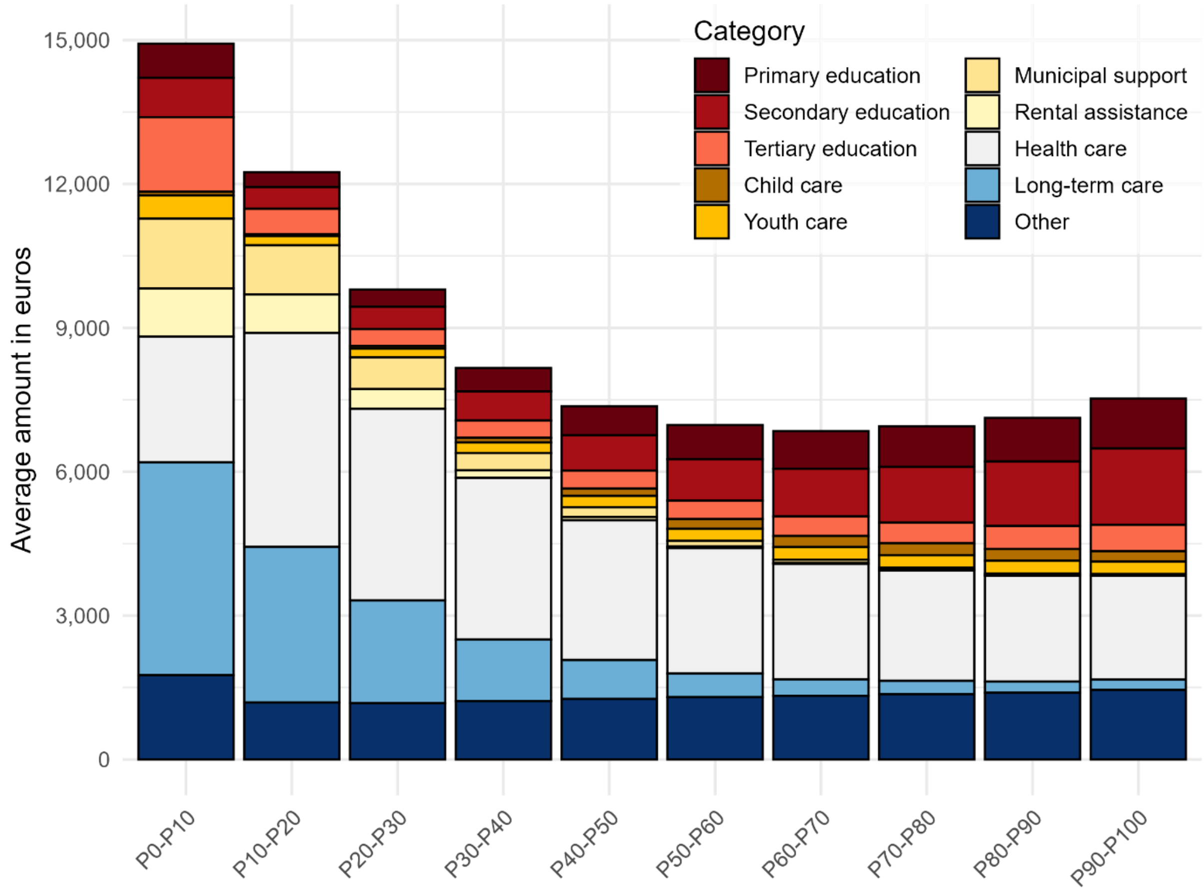
Note: This figure shows the amount of government spending received by each income group in 2016. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. Cash and in-kind transfers are assigned to the individuals who receive them or, in the case of individuals below the age of 20, their parents. Collective expenditure is assigned to individuals on a lump-sum basis.

Figure A.22: The cash transfers rate for each income group



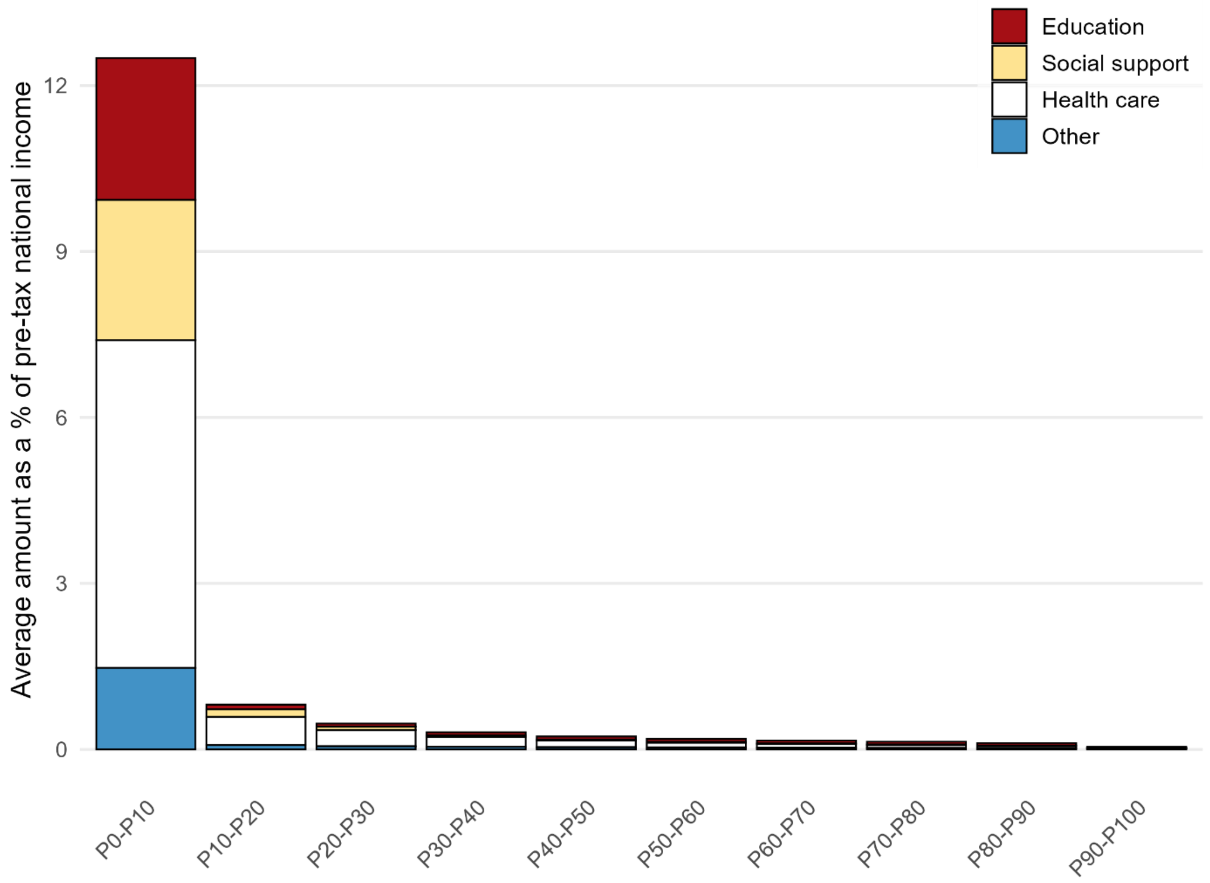
Note: This figure shows the amount of cash transfers received by each income group in 2016 divided by pre-tax national income, with more detailed categories than in Figure 11. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. Transfers are assigned to the individuals who receive them or, in the case of individuals below the age of 20, their parents.

Figure A.23: The average amount of in-kind transfers received by each income group



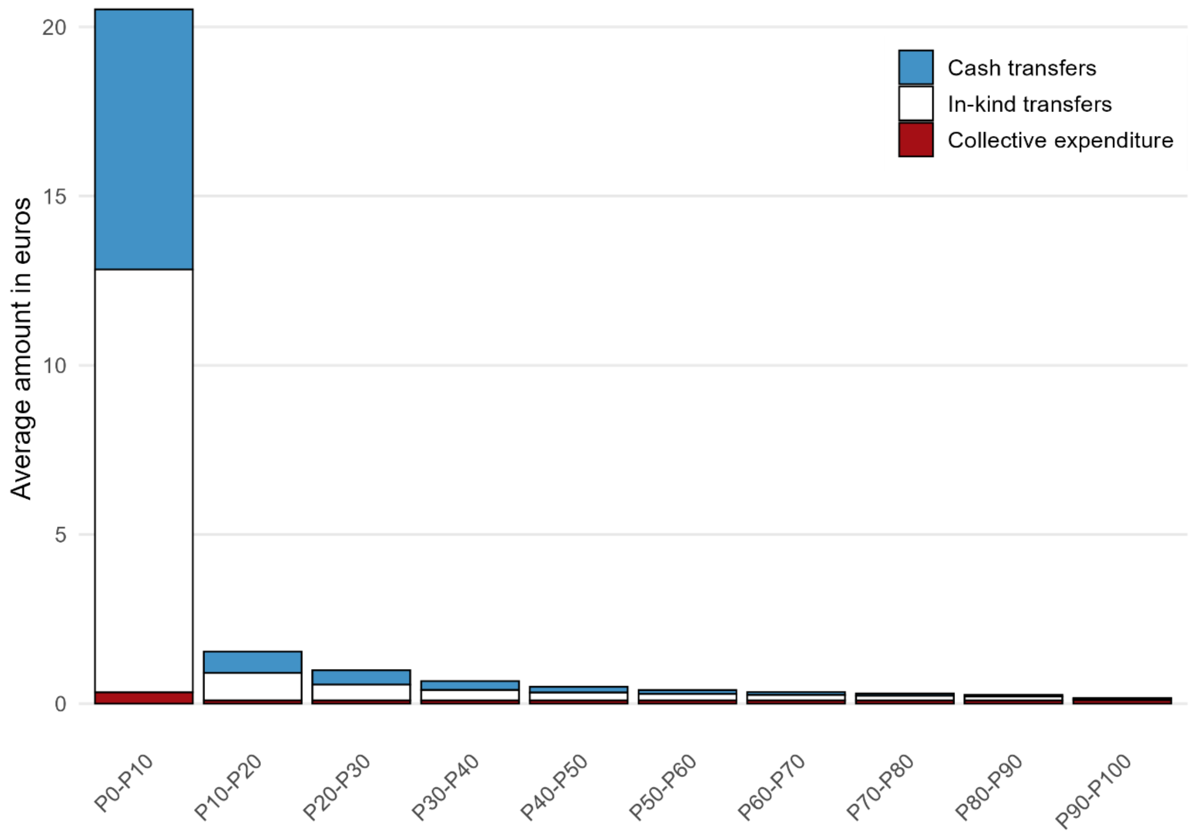
Note: This figure shows the amount of in-kind transfers received by each income group in 2016, with more detailed categories than in Figure 10. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. Transfers are assigned to the individuals who receive them or, in the case of individuals below the age of 20, their parents.

Figure A.24: The in-kind transfers rate for each income group



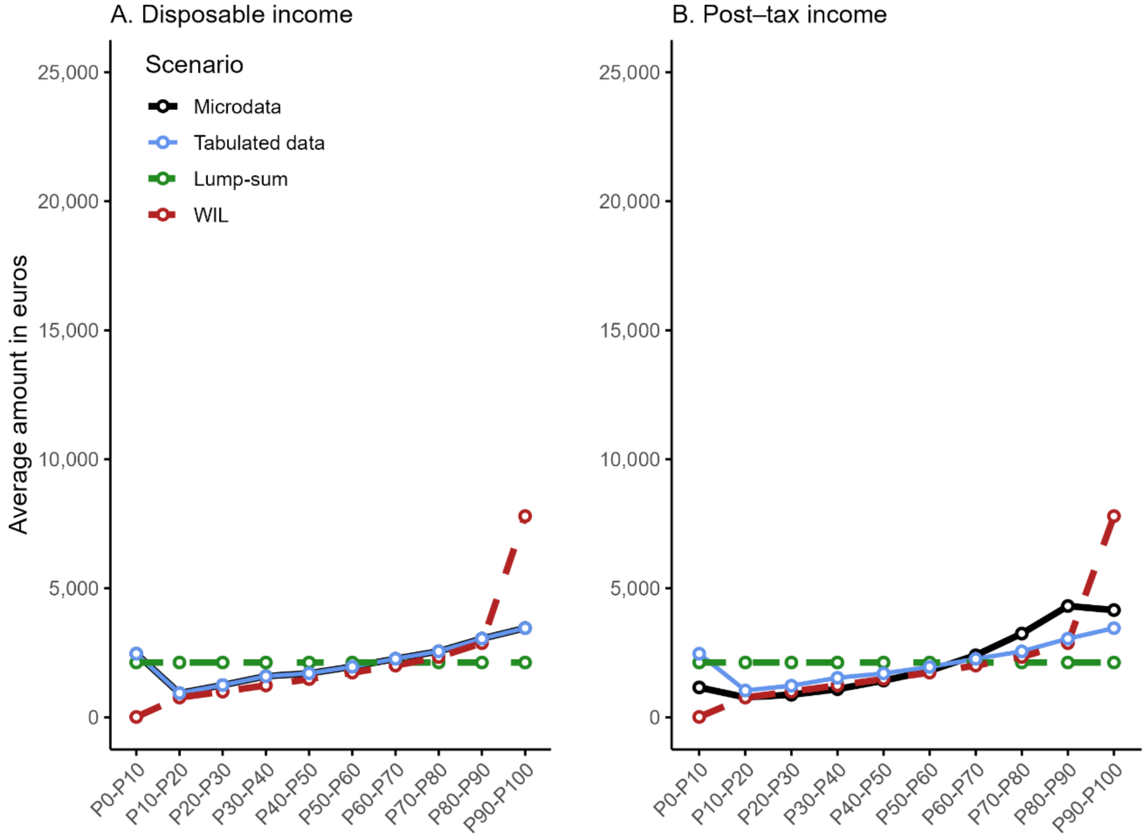
Note: This figure shows the amount of in-kind transfers received by each income group in 2016 divided by pre-tax national income, with more detailed categories than in Figure 11. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. Transfers are assigned to the individuals who receive them or, in the case of individuals below the age of 20, their parents.

Figure A.25: The government spending rate for each income group



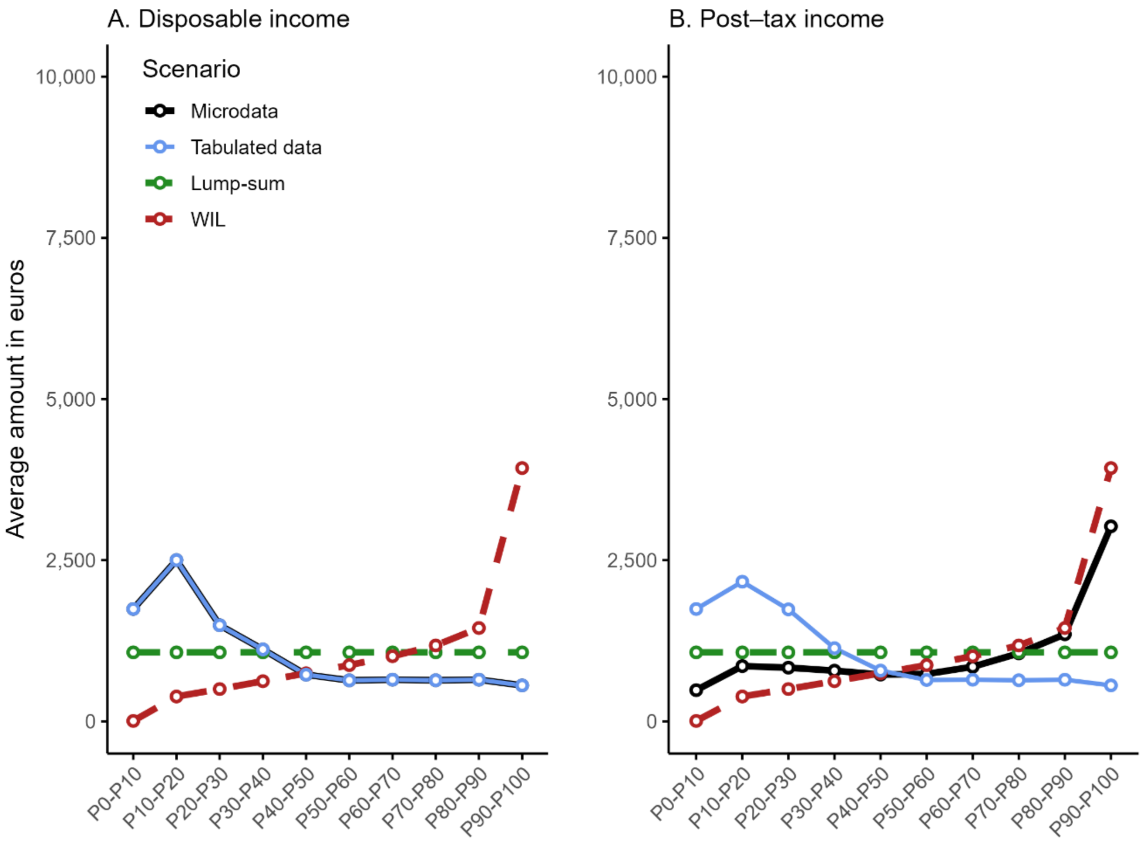
Note: This figure shows the amount of government spending received by each income group in 2016 divided by pre-tax national income. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. Cash and in-kind transfers are assigned to the individuals who receive them or, in the case of individuals below the age of 20, their parents. Collective expenditure is assigned to individuals in proportion to their disposable income.

Figure A.26: Education spending received by income group under different assumptions



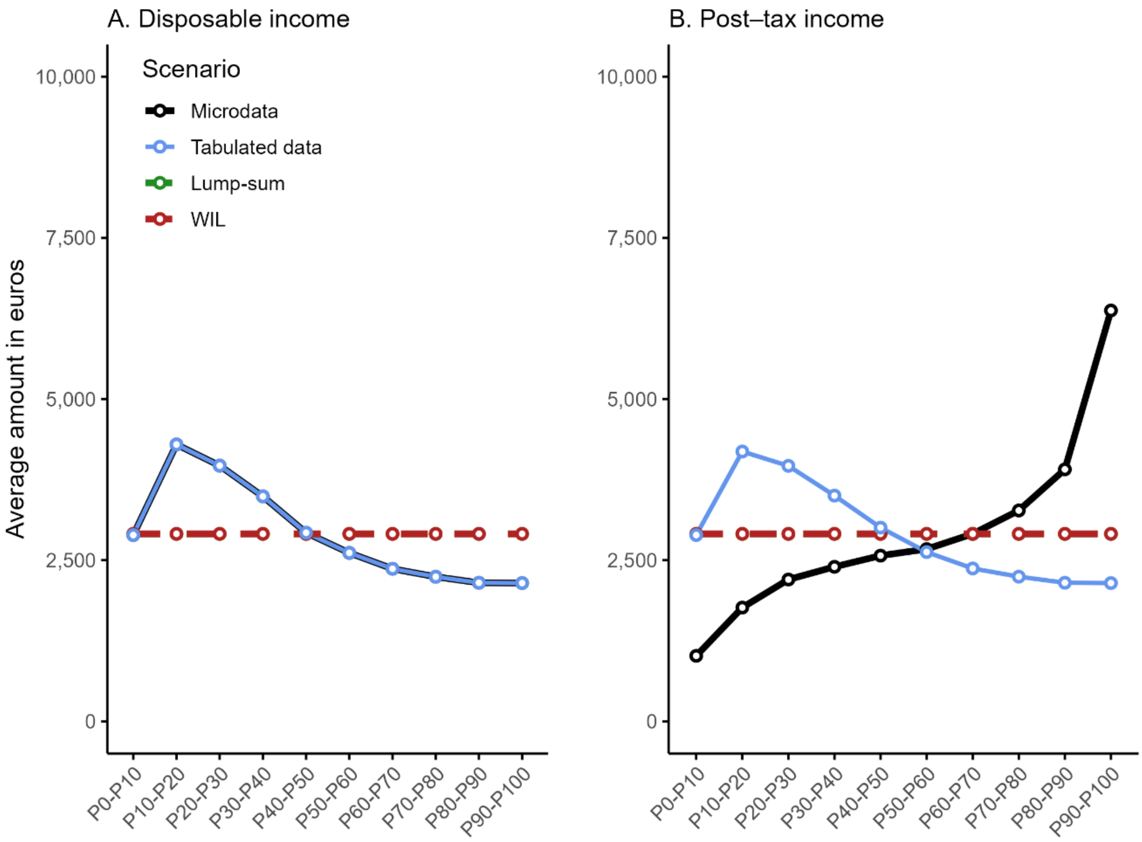
Note: This figure shows the average amount of education spending received by each income group in 2016 under different distributional assumptions regarding the receipt of in-kind transfers. The unit of analysis is the individual adult and income is split equally among all adult members of a household. Adults are ranked by their disposable income in the left and by their post-tax national income in the right panel.

Figure A.27: Social support received by income group under different assumptions



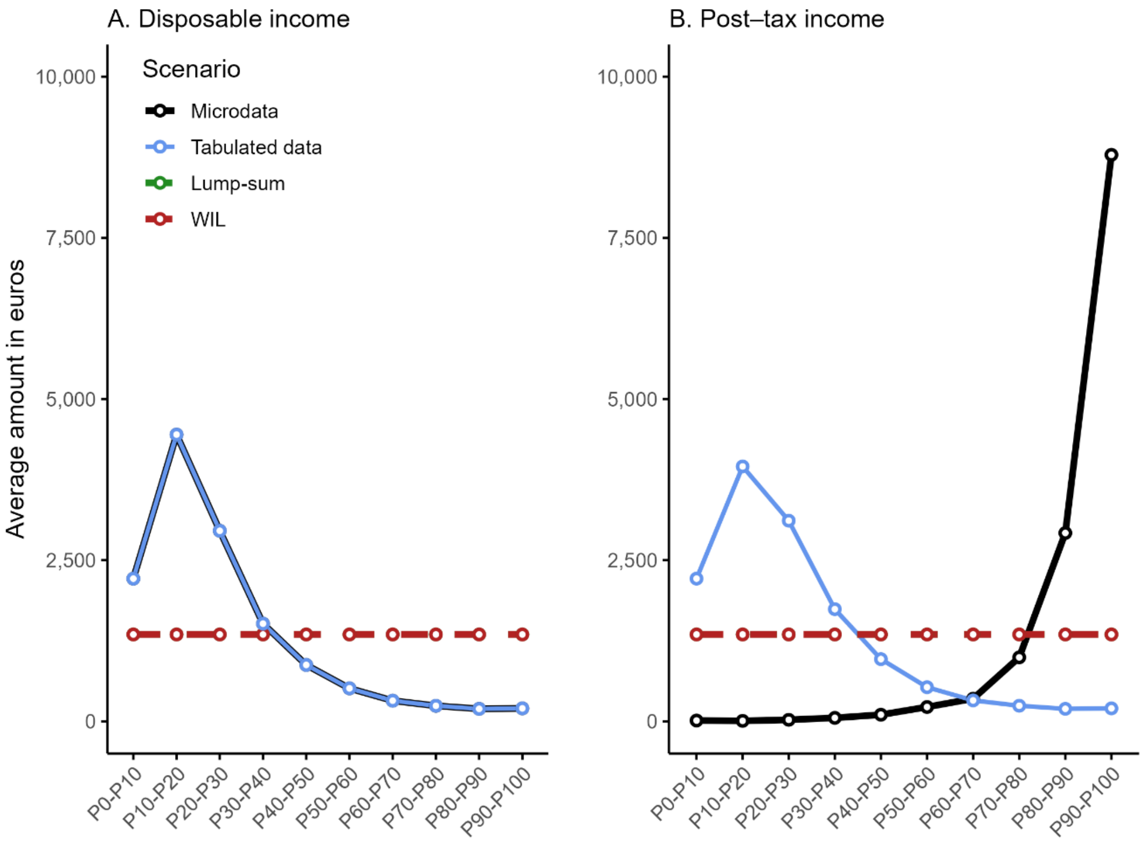
Note: This figure shows the average amount of social support received by each income group in 2016 under different distributional assumptions regarding the receipt of in-kind transfers. The unit of analysis is the individual adult and income is split equally among all adult members of a household. Adults are ranked by their disposable income in the left and by their post-tax national income in the right panel.

Figure A.28: Health care spending received by income group under different assumptions



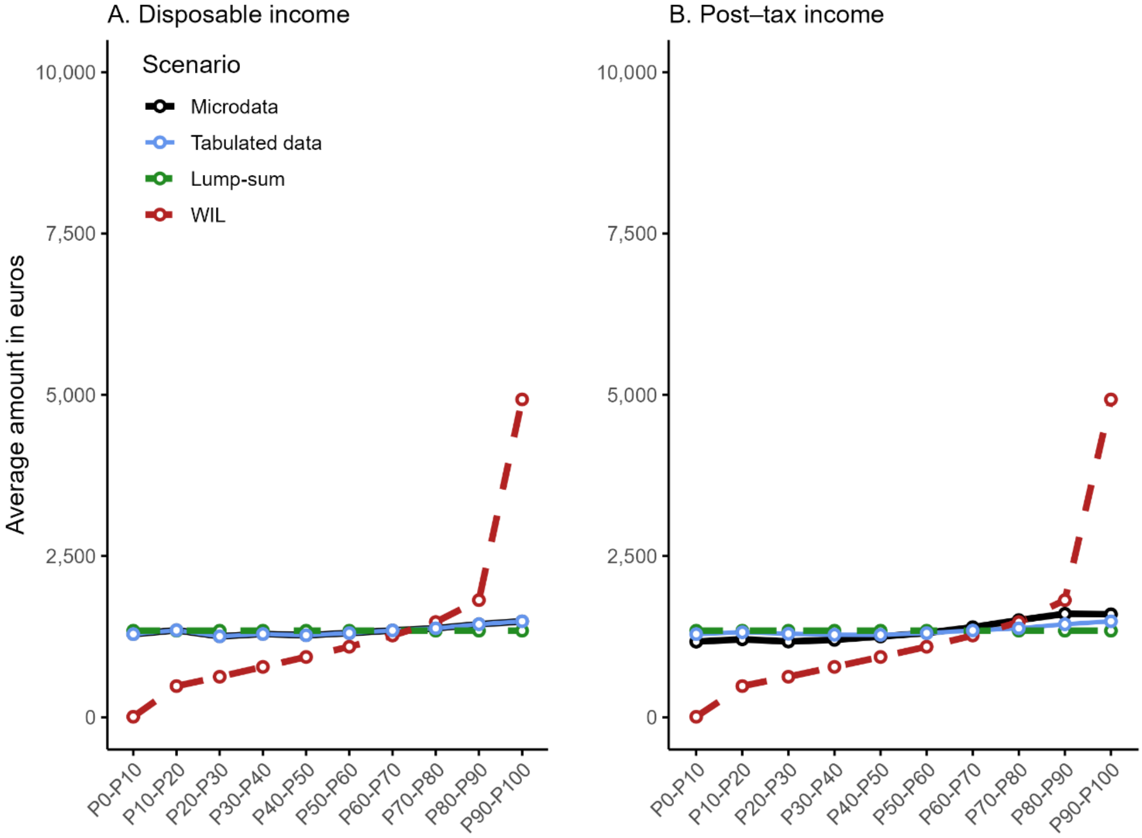
Note: This figure shows the average amount of health care spending received by each income group in 2016 under different distributional assumptions regarding the receipt of in-kind transfers. The unit of analysis is the individual adult and income is split equally among all adult members of a household. Adults are ranked by their disposable income in the left and by their post-tax national income in the right panel.

Figure A.29: Long-term care spending received by income group under different assumptions



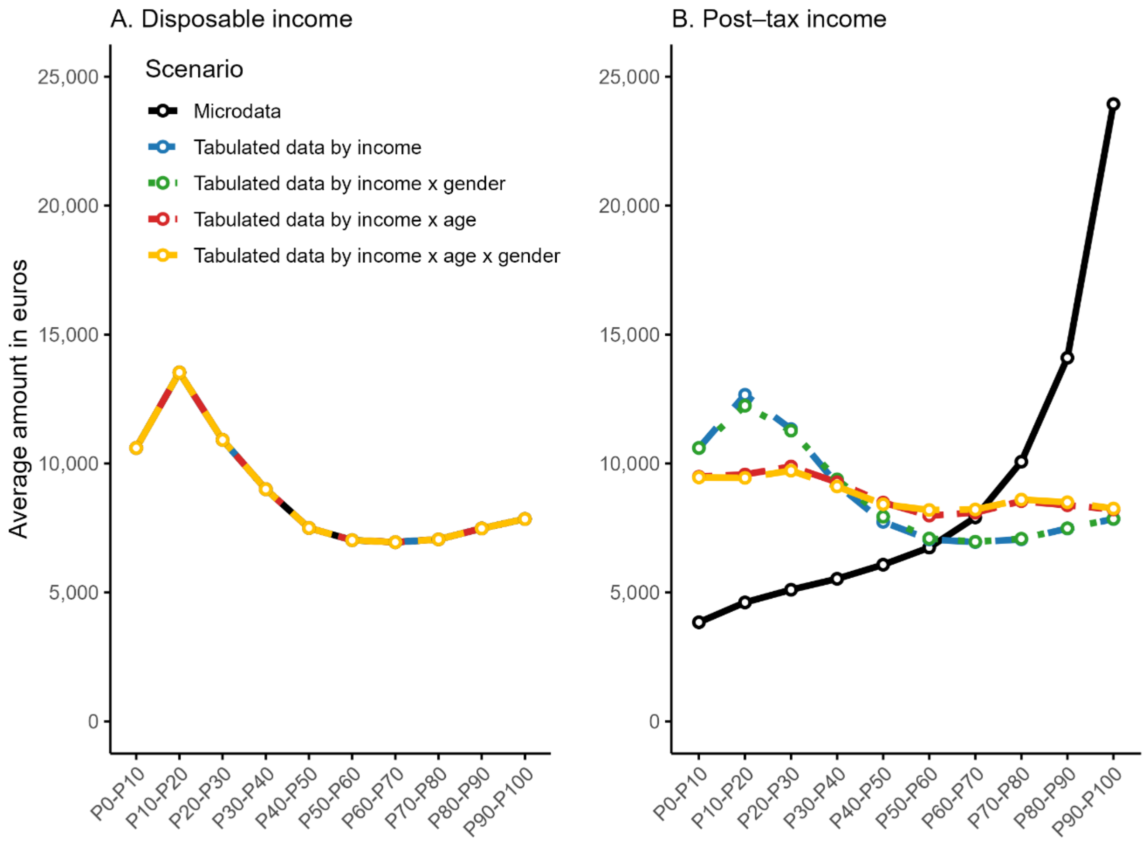
Note: This figure shows the average amount of long-term care spending received by each income group in 2016 under different distributional assumptions regarding the receipt of in-kind transfers. The unit of analysis is the individual adult and income is split equally among all adult members of a household. Adults are ranked by their disposable income in the left and by their post-tax national income in the right panel.

Figure A.30: Other in-kind transfers received by income group under different assumptions



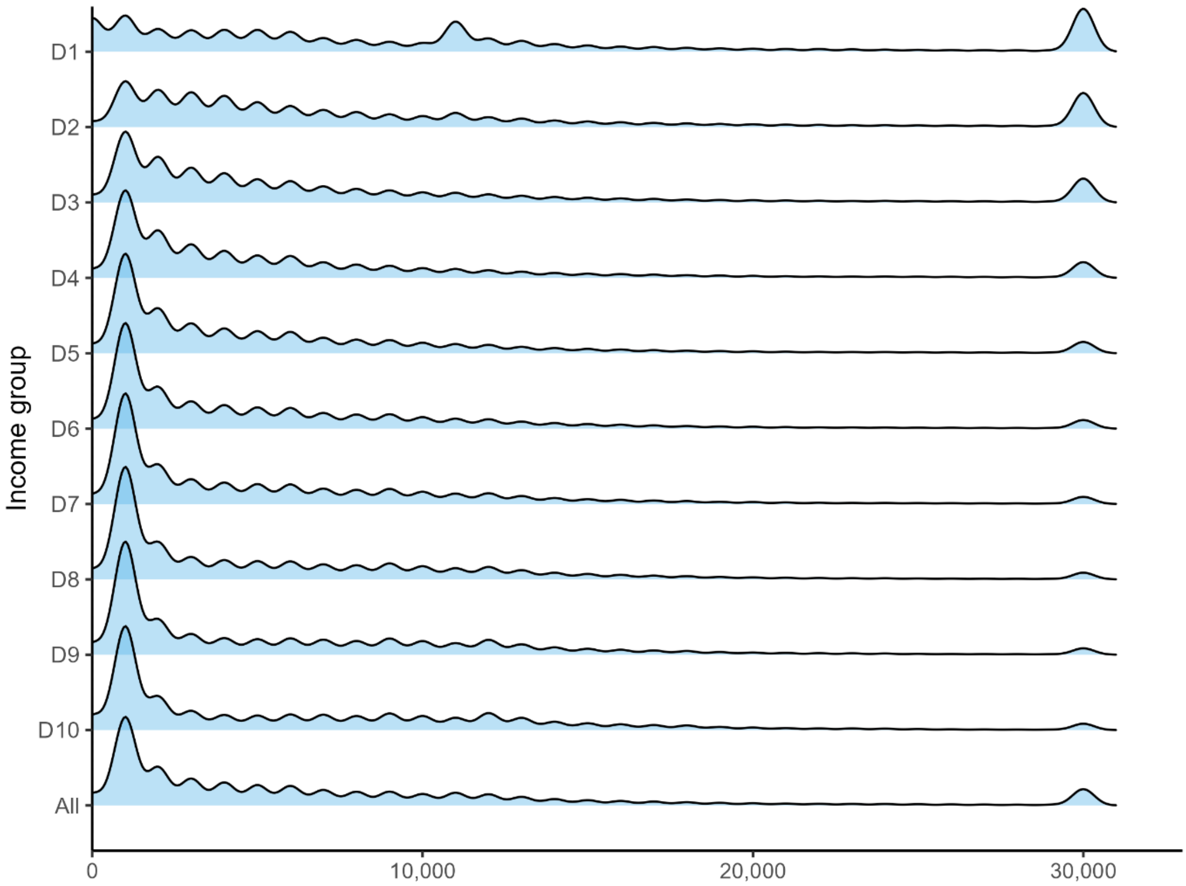
Note: This figure shows the average amount of other in-kind transfers received by each income group in 2016 under different distributional assumptions regarding the receipt of in-kind transfers. The unit of analysis is the individual adult and income is split equally among all adult members of a household. Adults are ranked by their disposable income in the left and by their post-tax national income in the right panel.

Figure A.31: In-kind transfers received by income group under different assumptions



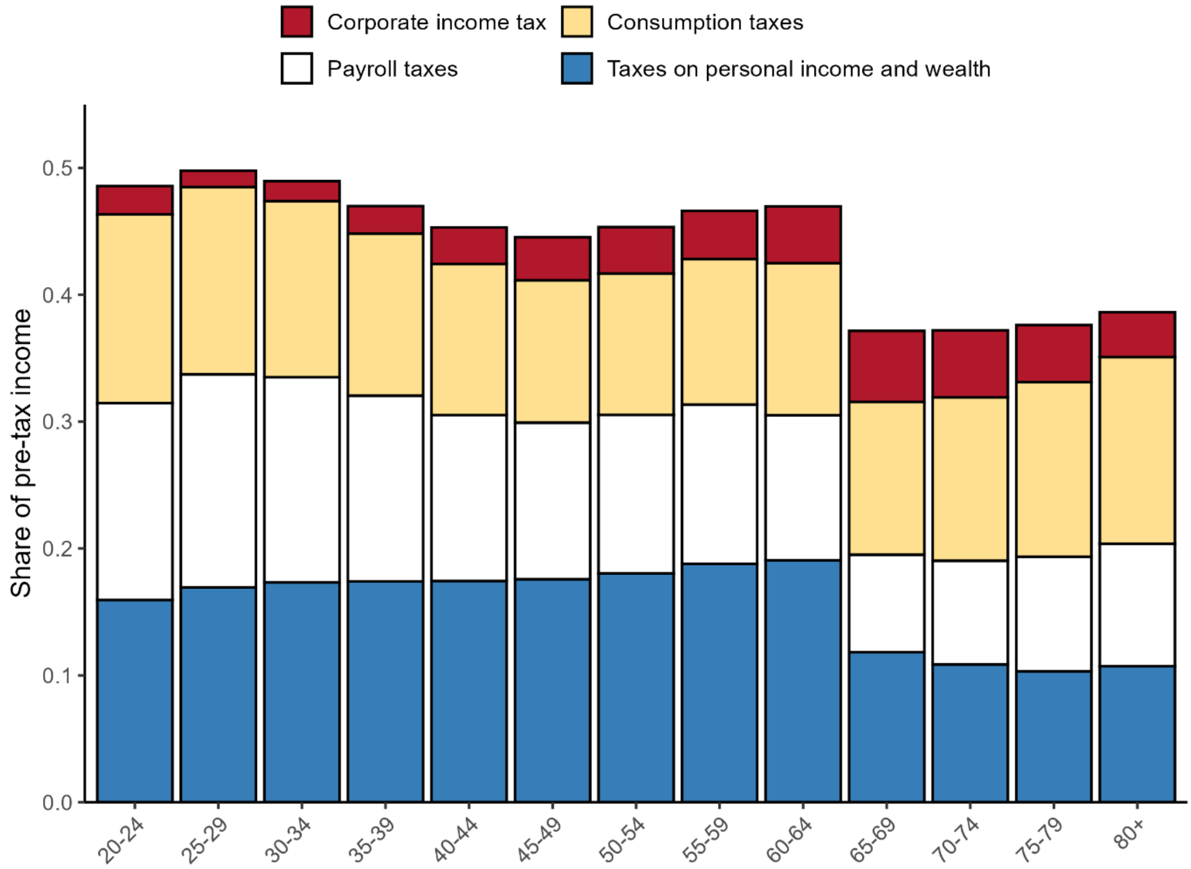
Note: This figure shows the average amount of other in-kind transfers received by each income group in 2016 under different distributional assumptions regarding the receipt of in-kind transfers. The unit of analysis is the individual adult and income is split equally among all adult members of a household. Adults are ranked by their disposable income in the left and by their post-tax national income in the right panel.

Figure A.32: The distribution of in-kind transfers received within each income group



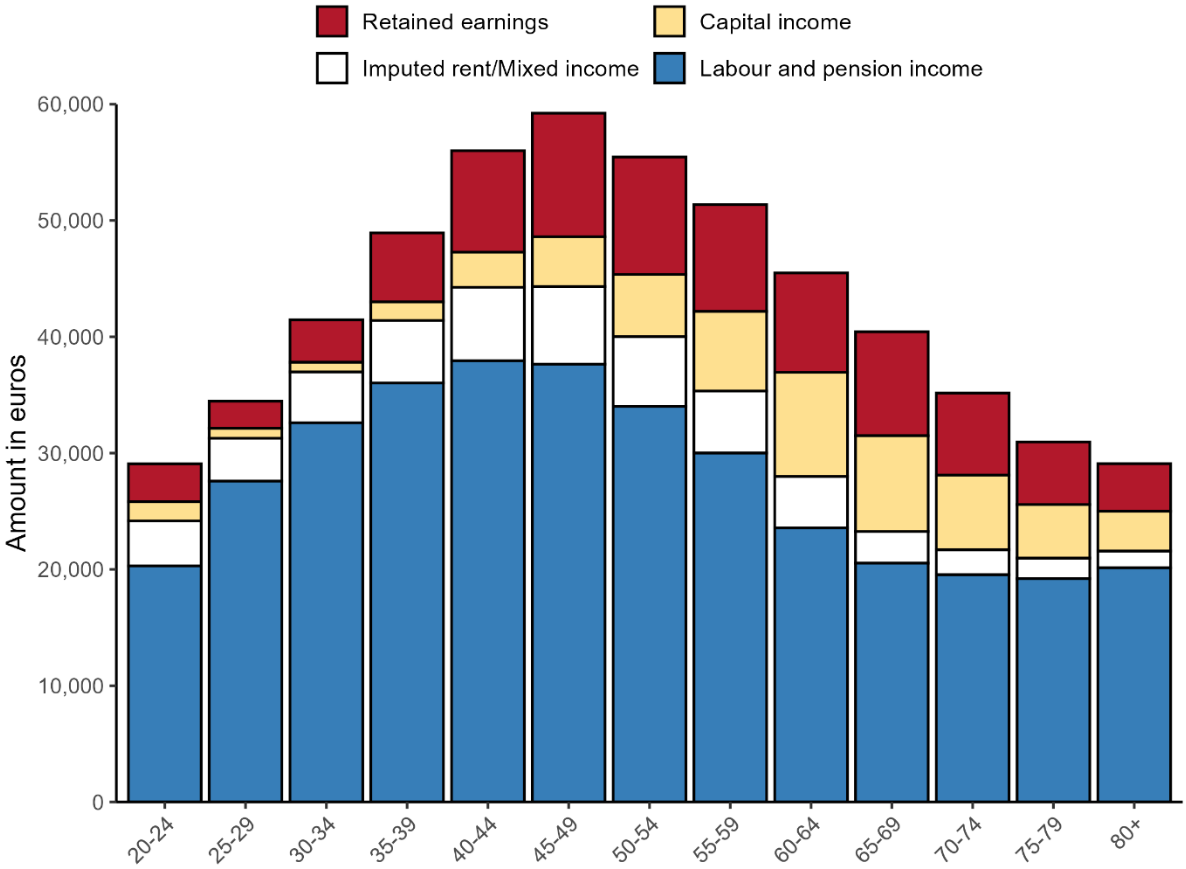
Note: This figure shows the distribution of in-kind transfers received by each income group in the Netherlands in 2016. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income.

Figure A.33: The payment of taxes by age



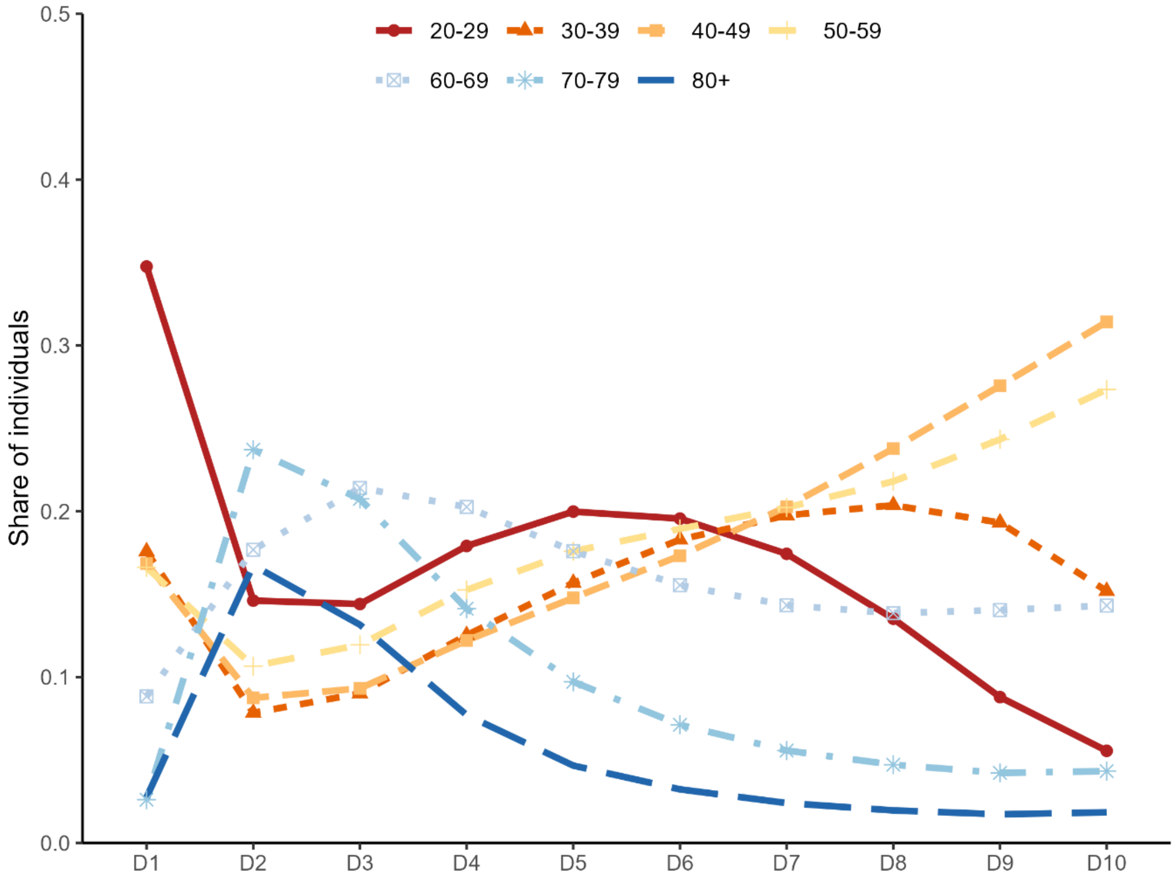
Note: This figure shows the amount of taxes paid expressed as a share of pre-tax national income for different age groups in 2016. The unit of analysis is the individual adult. Taxes on labour are assigned to workers. Taxes on capital are assigned to the owners of capital. Consumption taxes are assigned in proportion to the consumption of taxed goods and services.

Figure A.34: Average pre-tax national income by age



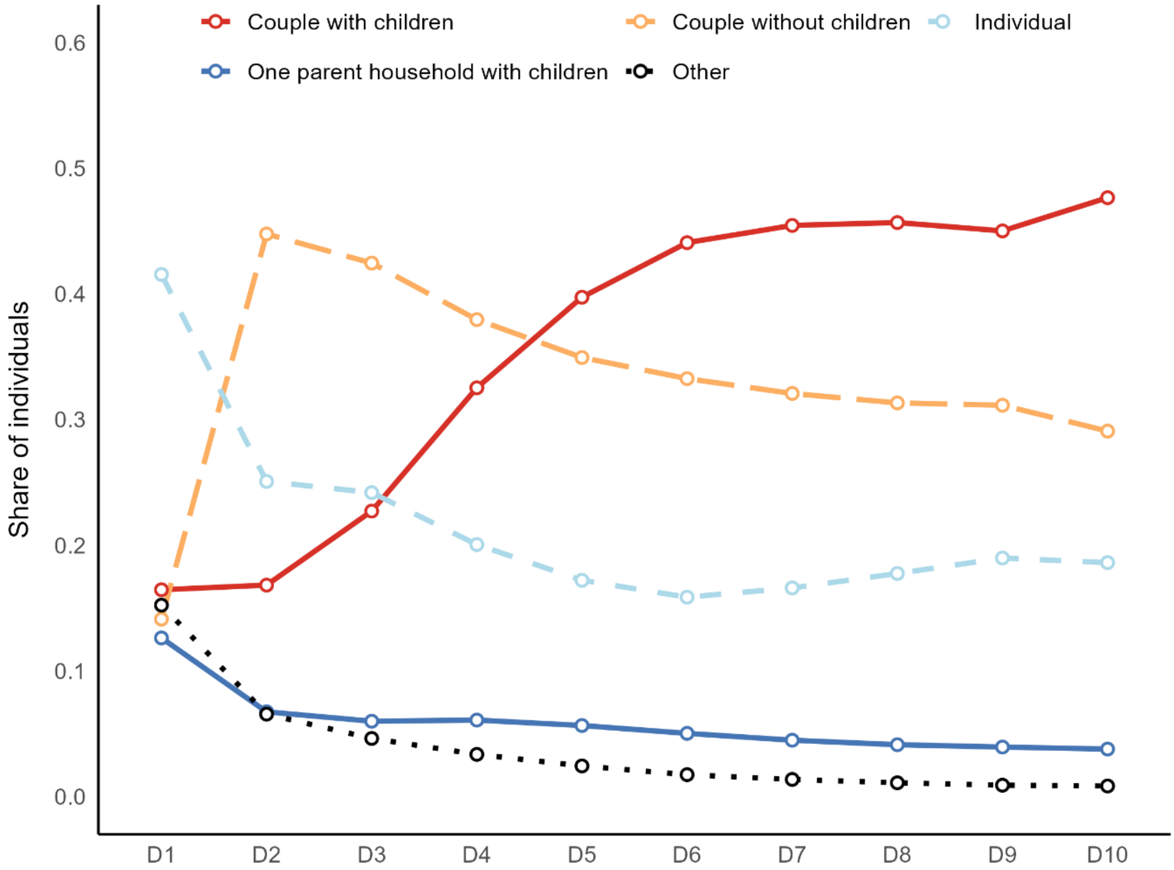
Note: This figure shows the average level of pre-tax national income for different age groups in 2016. The unit of analysis is the individual adult and income is split equally among the adult members of a household.

Figure A.35: Share of different age groups in each income group



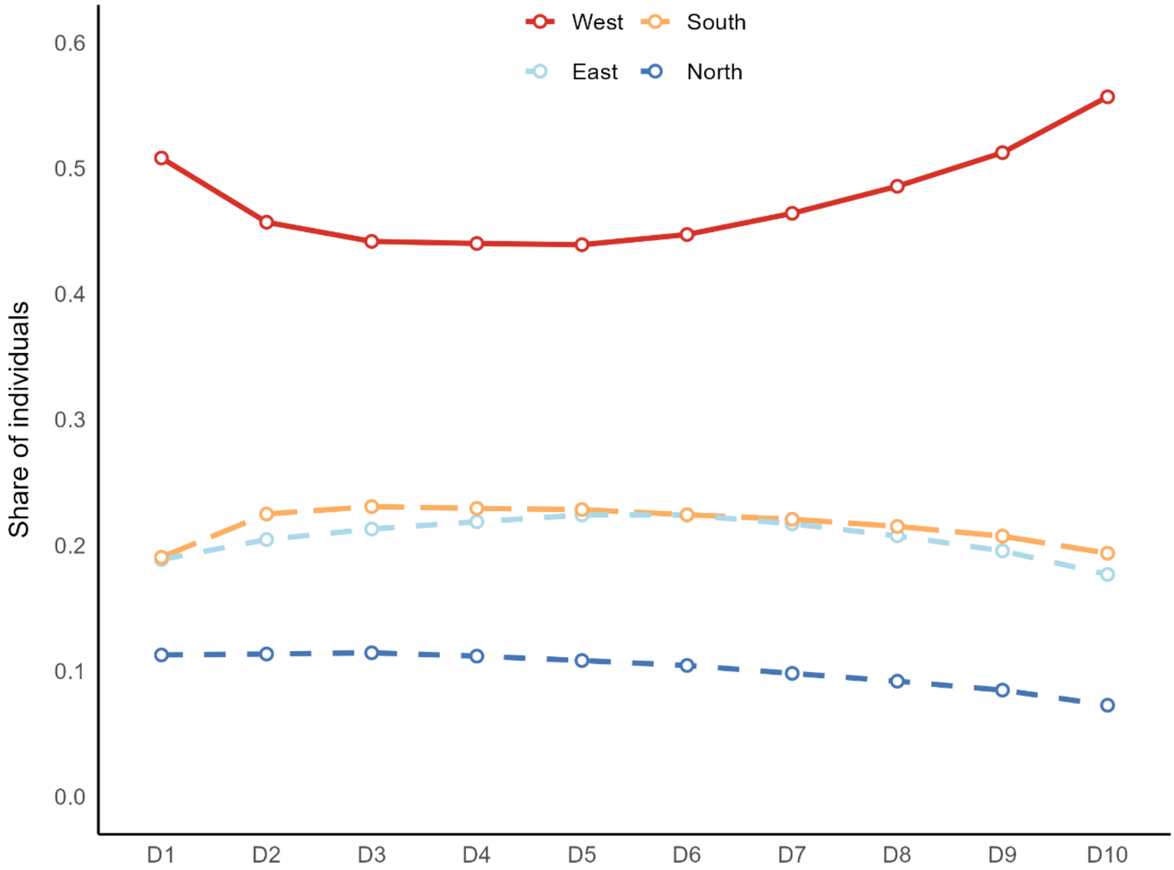
Note: This figure shows the share of different age groups in each income decile. The unit of analysis is the individual adult and income is split equally among the adult members of a household.

Figure A.36: Share of different household types in each income group



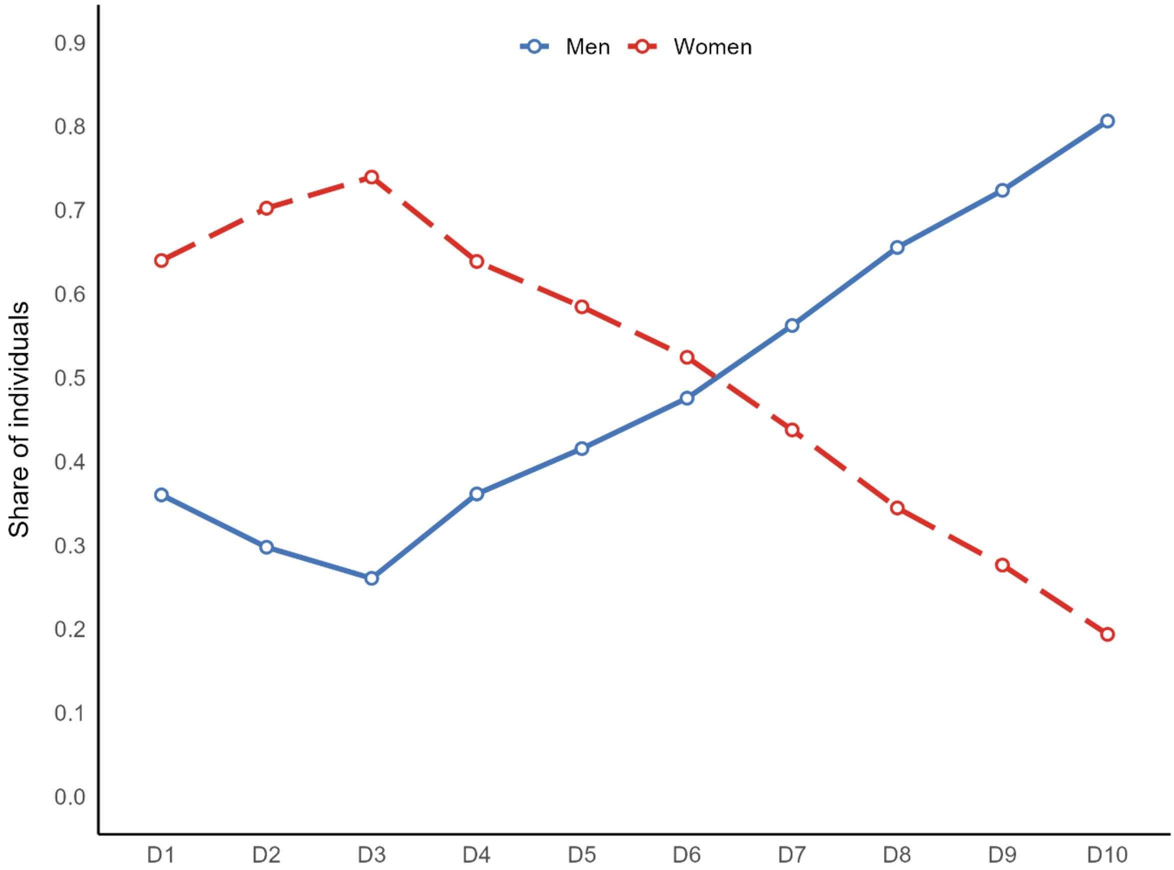
Note: This figure shows the share of different household types in each income decile. The unit of analysis is the individual adult and income is split equally among the adult members of a household.

Figure A.37: Share of different regions in each income group



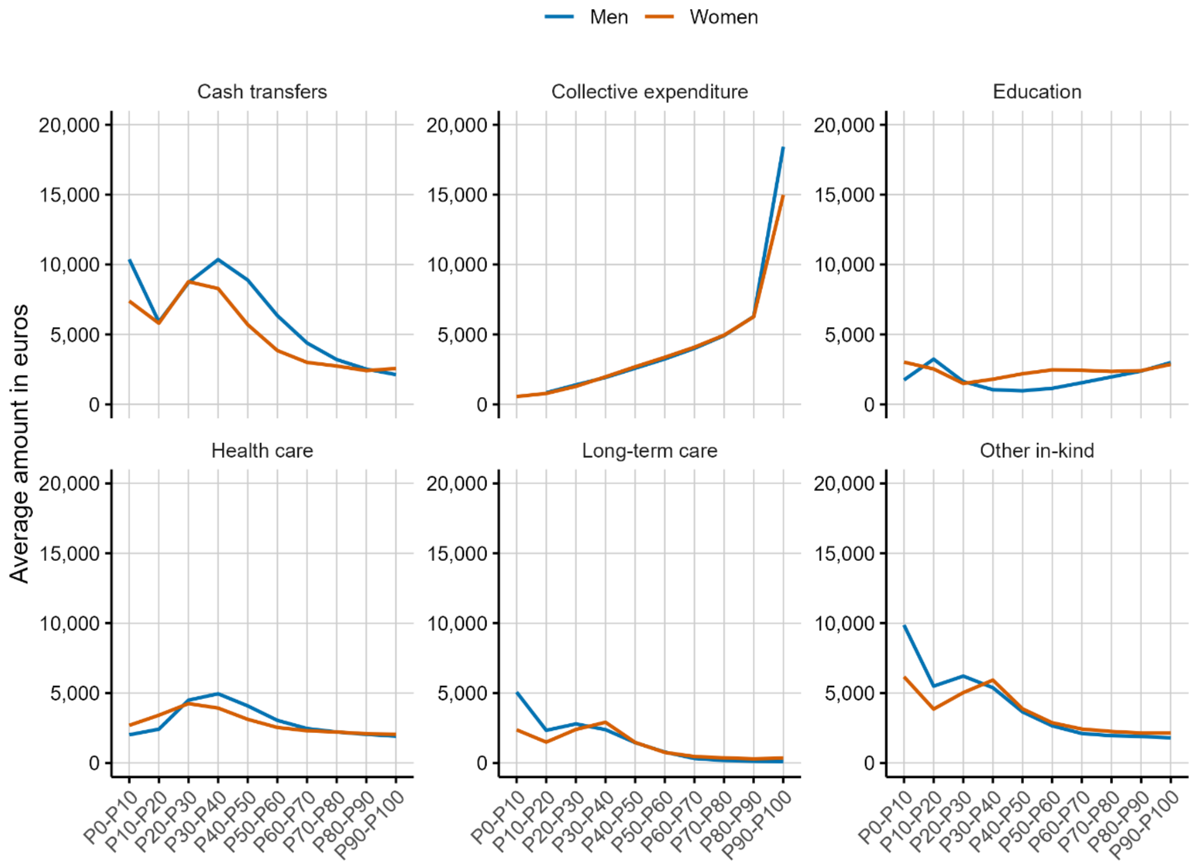
Note: This figure shows the share of different regions of residence in each income decile. The unit of analysis is the individual adult and income is split equally among the adult members of a household.

Figure A.38: Share of each gender in each income group



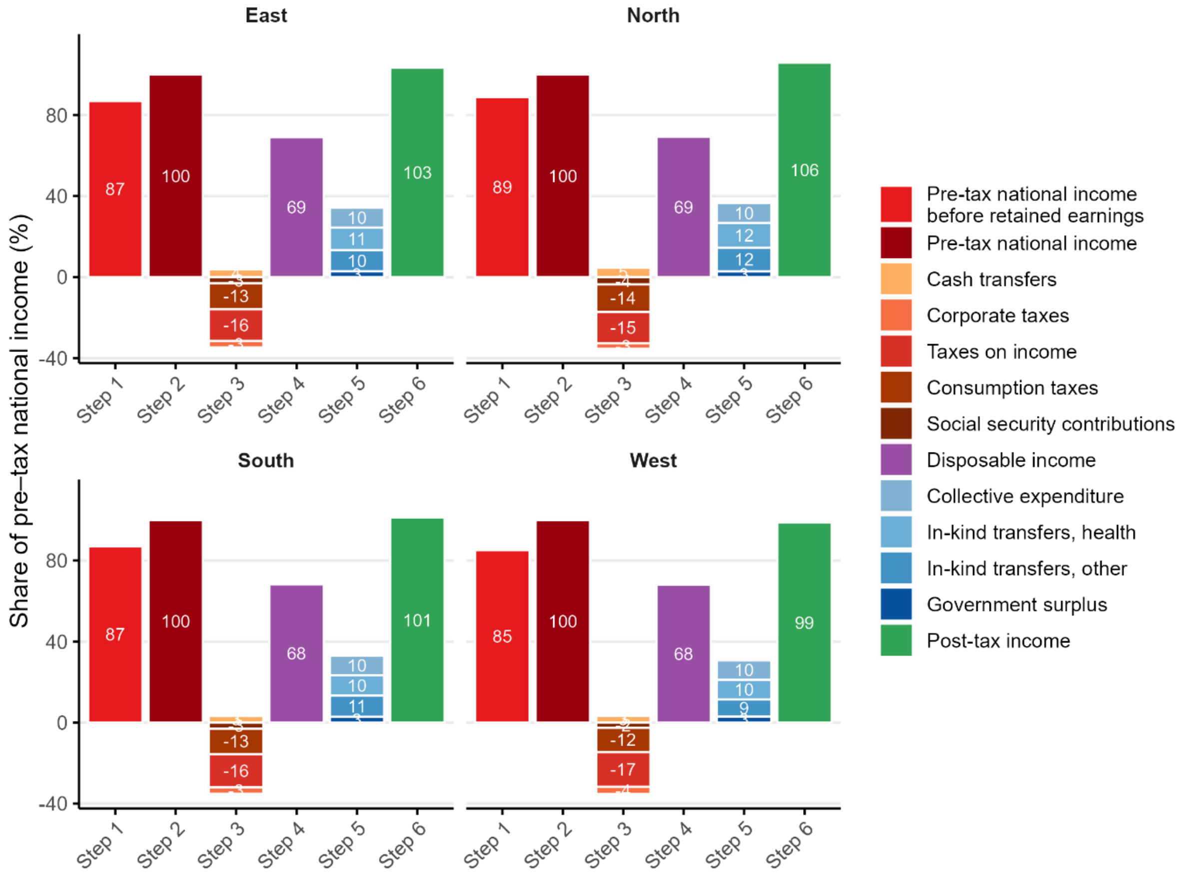
Note: This figure shows the share of men and women in each income decile. The unit of analysis is the individual adult and income is assigned to the individual who nominally earns it.

Figure A.39: The receipt of government spending by pretax income and gender



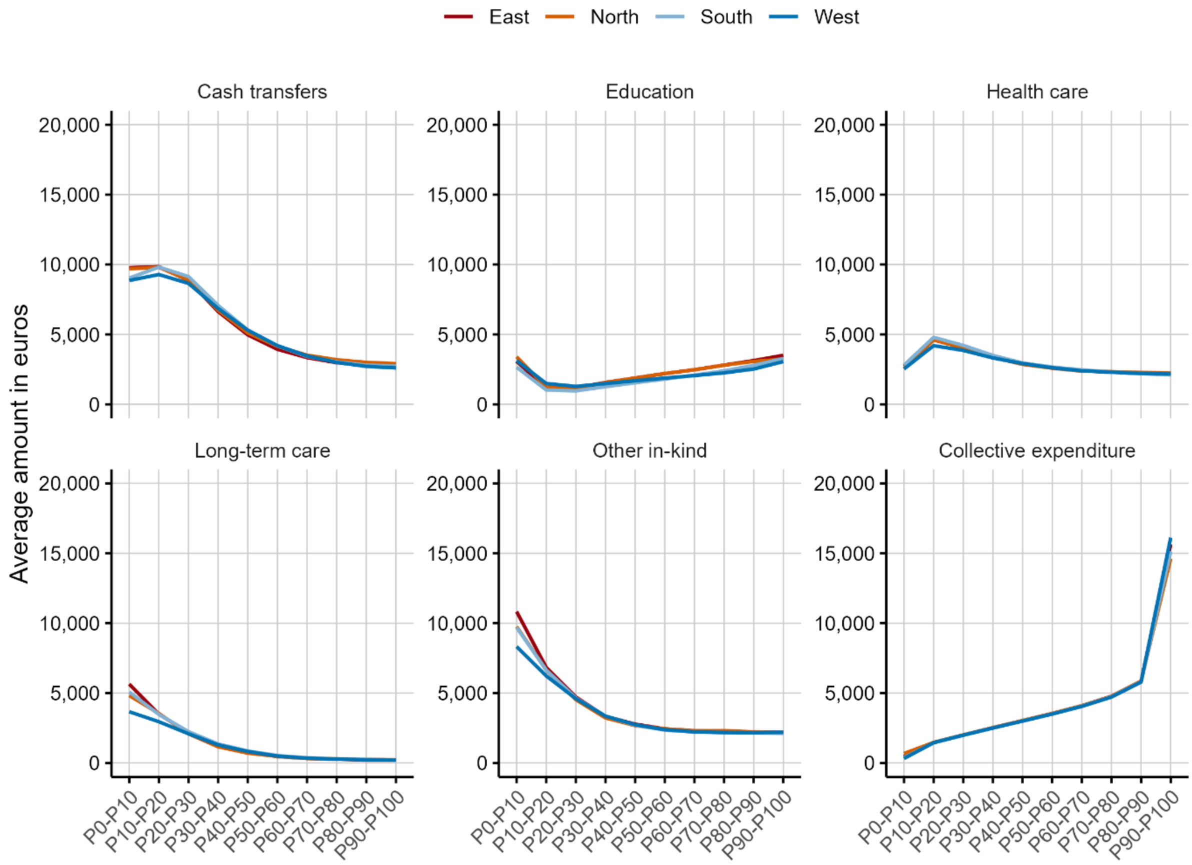
Note: This figure shows the amounts of transfers received by men and women, by different type of government spending. The unit of analysis is the individual adult and income is split equally among the adult members of a household.

Figure A.40: Transition from pretax to post-tax income, by region



Note: This figure illustrates the transition from pre-tax to post-tax income by different regions. Step 1 shows pre-tax income excluding retained earnings. In Step 2, retained earnings are included. Step 3 incorporates cash transfers and subtracts taxes and social security contributions, resulting in disposable income in Step 4. Step 5 adds collective expenditures, social transfers in kind, and the government surplus. The final outcome, in Step 6, is post-tax income.

Figure A.41: The receipt of government spending by pretax income and region



Note: This figure shows the amounts of transfers received by each geographical region.

Table A.1: Pre-tax factor income of the households sector, part 1

Income concept	Macro total (% of national income)	Macro total (million euros)	Micro total (million euros)	Difference (% of national income)	Microdata source	Allocation of micro-macro gap
National income, gross	78	462,351	466,880			
Operating surplus, gross	2	12,125				
Imputed rents of owner-occupied dwellings	7	43,680	38,888	0.8	Cadastral registry	Imputed rents
Intermediate use and taxes on owner-occupied dwellings	5	31,554				Imputed rents
Mixed income, gross	11	66,085				
Self-employed and rental income	9	55,365	53,363	0.3	Tax records	Self-employed and rental income
Other income, including from non-observed economic activities	2	10,720				Self-employed and rental income
Compensation of employees	56	333,541	332,275	0.2	Tax records	Compensation of employees

Note: This table presents the alignment between macroeconomic and microeconomic data for various income components in 2016. The first column lists the income components considered, while the second column shows the share of each component in total national income. The third column provides the macroeconomic totals for 2016, and the fourth column reports the sum of linked microdata. The fifth column displays the difference between macro and micro figures, expressed as a percentage of national income. The sixth column indicates the microdata source used, and the seventh column describes the method applied to allocate the discrepancy between macro and micro totals.

Table A.2: Pre-tax factor income of the households sector, part 2

Income concept	Macro total (% of national income)	Macro total (million euros)	Micro total (million euros)	Difference (% of national income)	Microdata source	Allocation of micro-macro gap
Property income, received	10	56,995				
Interest, received	0	2,550				
Actual interest received	1	4,803	2,978	0.3	Tax records; Information from financial institutions	Interest income
Financial intermediation services indirectly measured	0	-2,253				Interest income
Distributed income of corporations	2	14,158	8,778	0.9	Tax records; Information from financial institutions	Dividend income
Other investment income	7	40,283				Pension entitlements
Rents	0	4				Other real estate
Property income, paid	1	6,394				
Interest, paid	1	6,127				
Actual interest paid	5	31,575	30,522	0.2	Tax records; Information from financial institutions	Interest expenditure
Financial intermediation services indirectly measured	-4	-25,448				Interest expenditure
Rents	0	273	74	0	Tax records	Rents on land

Note: This table presents the alignment between macroeconomic and microeconomic data for various income components in 2016. The first column lists the income components considered, while the second column shows the share of each component in total national income. The third column provides the macroeconomic totals for 2016, and the fourth column reports the sum of linked microdata. The fifth column displays the difference between macro and micro figures, expressed as a percentage of national income. The sixth column indicates the microdata source used, and the seventh column describes the method applied to allocate the discrepancy between macro and micro totals.

Table A.3: Social contributions and benefits, part 1

Income concept	Macro total (% of national income)	Macro total (million euros)	Micro total (million euros)	Difference (% of national income)	Microdata source	Allocation of micro-macro gap
Social insurance surplus	3	14,874				Factor income
Net social contributions	30	174,659				
Net social contributions minus contributions for health care	20	119,015				
Employers' actual pension contributions	4	22,213	26,622	-0.7	Tax records, social security records.	Employers' pension contributions
Employers' actual non-pension contributions	6	36,543	36,469	0	Tax records, social security records.	Employers' non-pension contributions
Employers' actual health contributions	2	14,086	14,028	0	Tax records, social security records.	Employers' health contributions
Employers' imputed pension contributions	0	1,101	0	0.2	-	Employers' social contributions
Employers' imputed non-pension contributions	2	11,069	8,690	0.4	Tax records, social security records.	Employers' imputed non-pension contributions

Note: This table presents the alignment between macroeconomic and microeconomic data for various income components in 2016. The first column lists the income components considered, while the second column shows the share of each component in total national income. The third column provides the macroeconomic totals for 2016, and the fourth column reports the sum of linked microdata. The fifth column displays the difference between macro and micro figures, expressed as a percentage of national income. The sixth column indicates the microdata source used, and the seventh column describes the method applied to allocate the discrepancy between macro and micro totals.

Table A.4: Social contributions and benefits, part 2

Income concept	Macro total (% of national income)	Macro total (million euros)	Micro total (million euros)	Difference (% of national income)	Microdata source	Allocation of micro-macro gap
Households' actual pension contributions	2	12,931	8,844	0.7	Tax records, social security records.	Households' pension contributions
Households' actual non-pension contributions	11	66,187	64,900	0.2	Tax records, social security records.	Households' non-pension contributions
Contributions for long-term care	2	14,275	14,016	0	Tax records.	Contributions for long-term care
Health insurance premiums	5	27,282	26,052	0.2	Tax records.	Health insurance premiums
Households' imputed pension contributions	6	33,716				Pension entitlements
Households' imputed non-pension contributions	0	501				Pension entitlements
Social security and insurance benefits	18	104,141	107,708	-0.6		
Social security benefits in cash	9	53,300	55,674	-0.4	Tax records, social security records.	Social security benefits in cash
Other social insurance benefits	9	50,841	52,034	-0.2	Tax records, social security records.	Other social insurance benefits

Note: This table presents the alignment between macroeconomic and microeconomic data for various income components in 2016. The first column lists the income components considered, while the second column shows the share of each component in total national income. The third column provides the macroeconomic totals for 2016, and the fourth column reports the sum of linked microdata. The fifth column displays the difference between macro and micro figures, expressed as a percentage of national income. The sixth column indicates the microdata source used, and the seventh column describes the method applied to allocate the discrepancy between macro and micro totals.

Table A.5: Taxes, part 1

Income concept	Macro total (% of national income)	Macro total (million euros)	Micro total (million euros)	Difference (% of national income)	Microdata source	Allocation of micro-macro gap
Taxes	44	258,411				
Taxes, excluding social insurance contributions	35	207,742				
Indirect taxes	12	73,733				Indirect taxes in budget survey
Corporate taxes	3	19,754				
Corporate taxes paid by closely held corporations owned by Dutch shareholders	1	6,951	6,951	0	Tax records	No gap by construction
Corporate taxes paid by Dutch corporations owned by portfolio investors, the government, central bank and pension funds	1	4,570				Equity wealth, factor income, pension entitlements
Corporate taxes paid by foreign corporations owned by Dutch shareholders	1	8,212				Equity wealth, factor income, pension entitlements
Taxes paid by the government	0	20				Factor income
Income taxes	16	95,659				
Taxes on income, wealth, etc.	10	56,755	65,212	-1.4	Tax records	Taxes on income, wealth, etc.
Households' actual non-pension contributions	11	66,187	64,900	0.2	Tax records	Households' actual non-pension contributions
Contributions for long-term care	2	14,275	14,016	0	Tax records	Contributions for long-term care

Note: This table presents the alignment between macroeconomic and microeconomic data for various income components in 2016. The first column lists the income components considered, while the second column shows the share of each component in total national income. The third column provides the macroeconomic totals for 2016, and the fourth column reports the sum of linked microdata. The fifth column displays the difference between macro and micro figures, expressed as a percentage of national income. The sixth column indicates the microdata source used, and the seventh column describes the method applied to allocate the discrepancy between macro and micro totals.

Table A.6: Taxes, part 2

Income concept	Macro total (% of national income)	Macro total (million euros)	Micro total (million euros)	Difference (% of national income)	Microdata source	Allocation of micro-macro gap
Payroll taxes and health insurance premiums	11	67,409				
Employers' actual pension contributions	0	0				
Employers' actual non-pension contributions	6	36,543	36,469	0	Tax records, social security records	Employers' imputed non-pension contributions
Employers' imputed pension contributions	0	1,101	0	0.2	-	Employers' social contributions
Employers' imputed non-pension contributions	0	2,483	0	0.4	-	Employers' social contributions
Payroll taxes for health care	2	14,086	14,028	0	Tax records, social security records	Employers' health contributions
Health insurance premiums	5	27,282	26,052	0.2	Tax records	Health insurance premiums
Inheritance and gift taxes	0	1,855	1,563	0	Tax records	Inheritance and gift taxes
Net taxes paid by foreigners	1	5,056				

Note: This table presents the alignment between macroeconomic and microeconomic data for various income components in 2016. The first column lists the income components considered, while the second column shows the share of each component in total national income. The third column provides the macroeconomic totals for 2016, and the fourth column reports the sum of linked microdata. The fifth column displays the difference between macro and micro figures, expressed as a percentage of national income. The sixth column indicates the microdata source used, and the seventh column describes the method applied to allocate the discrepancy between macro and micro totals.

Table A.7: Government spending

Income concept	Macro total (% of national income)	Macro total (million euros)	Micro total (million euros)	Difference (% of national income)	Microdata source	Allocation of micro-macro gap
Spending	43	252,617				
Spending, excluding social insurance	33	195,733				
Cash transfers	13	77,775	79,986	-0.4		
Social security benefits in cash	9	53,300	55,674	-0.4	Tax records, social security records	Social security benefits in cash
Other social insurance benefits	1	3,584	3,668	0	Tax records, social security records	Other social insurance benefits
Social assistance benefits in cash	4	20,891	20,643	0	Tax records	Social assistance benefits in cash
In-kind transfers	20	117,217				
Education	5	28,311			Administrative records	Enrolment by education type
Long-term care	3	17,972	17,617	0.1	Administrative records	Long-term care transfers
Health care	7	38,777	34,062	0.8	Insurance records	Health care transfers
Child care	0	2,095	1,989	0	Administrative records	Child care transfers
Youth care	1	3,494	2,285	0.2	Administrative records	Youth care transfers
Municipal support	1	5,338	4,523	0.1	Administrative records	Municipal support
Rental assistance	1	3,339	3,244	0	Administrative records	Rental assistance
Other in-kind transfers	3	17,891				
Collective expenditure	10	57,624				Disposable income
Government surplus	3	17,064				Factor income

Note: This table presents the alignment between macroeconomic and microeconomic data for various income components in 2016. The first column lists the income components considered, while the second column shows the share of each component in total national income. The third column provides the macroeconomic totals for 2016, and the fourth column reports the sum of linked microdata. The fifth column displays the difference between macro and micro figures, expressed as a percentage of national income. The sixth column indicates the microdata source used, and the seventh column describes the method applied to allocate the discrepancy between macro and micro totals.

Table A.8: The distribution of income in 2016

		pre-tax factor income			pre-tax national income			post-tax national income		
Income group	Number of adults	Income threshold (€)	Average income (€)	Income share	Income threshold (€)	Average income (€)	Income share	Income threshold (€)	Average income (€)	Income share
Full population	13,332,368		38,226	100		28,789	100		30,356	100
Bottom 50%	6,666,184		18,365	24		10,329	17.9		12,837	21.1
Middle 40%	5,332,947	32,073	44,769	46.8	22,183	31,349	43.6	22,916	31,975	42.1
Top 10%	1,333,237	65,768	111,365	29.1	46,629	110,849	38.5	47,238	111,473	36.7
Top 1%	133,324	154,625	325,847	8.5	163,627	487,376	16.9	164,223	488,035	16.1
Top 0.1%	13,333	502,561	1,194,153	3.1	803,387	2,174,535	7.6	804,171	2,175,178	7.2
Top 0.01%	1,334	1,993,323	4,417,744	1.2	3,527,095	8,959,092	3.1	3,527,406	8,959,708	3
Top 0.001%	134	7,932,265	14,752,033	0.4	15,728,910	33,547,210	1.2	15,729,308	33,547,777	1.1
Top 0.0001%	14	26,424,388	31,473,562	0.1	77,230,127	94,143,977	0.3	77,230,557	94,144,284	0.3

Note: This table presents statistics on the distribution of additional intermediate income concepts compared to Table 2, namely pre-tax factor income, pre-tax national income and post-tax national income in the Netherlands in 2016. The unit of analysis is the adult (20+ years old) and income is split among all adult members of a household equally. Income groups are defined in terms of all adults in the population. Adults are ranked according to the income concept that is studied such that they may belong to different income groups depending on the concept of income.

Table A.9: The distribution of income in 2016, not equally split

		pre-tax factor income		pre-tax national income		post-tax national income	
Income group	Number of adults	Average income (€)	Income share	Average income (€)	Income share	Average income (€)	Income share
Full population	13,332,368	44,371	100	44,371	100	44,747	100
Bottom 50%	6,666,184	6,683	7.5	13,170	14.8	17,749	19.8
Middle 40%	5,332,947	53,539	48.3	49,410	44.5	48,682	43.5
Top 10%	1,333,237	196,134	44.2	180,218	40.6	163,995	36.6
Top 1%	133,324	746,771	16.8	743,995	16.8	686,509	15.3
Top 0.1%	13,333	3,285,973	7.4	3,348,115	7.5	3,177,671	7.1
Top 0.01%	1,334	13,528,064	3.1	13,844,030	3.1	13,352,624	3
Top 0.001%	134	52,392,529	1.2	53,667,655	1.2	52,218,348	1.2
Top 0.0001%	14	161,595,026	0.4	165,615,351	0.4	161,785,379	0.4

Note: This table presents statistics on the distribution of additional intermediate income concepts compared to Table 2, namely pre-tax factor income, pre-tax national income and post-tax national income in the Netherlands in 2016. The unit of analysis is the adult (20+ years old) and income is assigned to the individual who nominally earns it. Income groups are defined in terms of all adults in the population. Adults are ranked according to the income concept that is studied such that they may belong to different income groups depending on the concept of income.

Table A.10: Transition matrices between pretax and post-tax income ranks

A. Microdata

	P0-P1	P1-P10	P10-P50	P50-P90	P90-P99	P99-P100
P0-P1	40	23	24	10	3	0
P1-P10	5	45	34	9	7	0
P10-P50	0	12	72	14	2	0
P50-P90	0	0	20	77	3	0
P90-P99	0	0	0	30	69	1
P99-P100	0	0	0	0	9	91

B. Lump-sum

	P0-P1	P1-P10	P10-P50	P50-P90	P90-P99	P99-P100
P0-P1	39	23	38	0	0	0
P1-P10	5	60	35	0	0	0
P10-P50	0	8	86	6	0	0
P50-P90	0	0	5	93	2	0
P90-P99	0	0	0	8	91	1
P99-P100	0	0	0	0	7	92

C. WIL

	P0-P1	P1-P10	P10-P50	P50-P90	P90-P99	P99-P100
P0-P1	39	23	38	0	0	0
P1-P10	5	60	35	0	0	0
P10-P50	0	8	86	6	0	0
P50-P90	0	0	5	93	2	0
P90-P99	0	0	0	8	91	1
P99-P100	0	0	0	0	7	92

D. Tabulated data

	P0-P1	P1-P10	P10-P50	P50-P90	P90-P99	P99-P100
P0-P1	39	23	38	0	0	0
P1-P10	5	60	35	0	0	0
P10-P50	0	8	86	6	0	0
P50-P90	0	0	5	92	2	0
P90-P99	0	0	0	8	91	1
P99-P100	0	0	0	0	7	92

Note: This table presents the transition matrices between pre- and post-tax groups, for different scenarios regarding the distribution of in-kind transfers (see Section 5.3 for details). For each group of pre-tax income in columns, the tables present the share of the individual ending-up in corresponding groups of post-tax income. For example, in the *lump-sum* scenario, 38% of individuals in the first percentile of the pre-tax income distribution end up in the income group P10-P50 of the post-tax income distribution.

3.9. Appendix B Institutional Details

3.9.1. B.1 Taxation

Personal income taxes The Income Tax Act of 2001 provides the legal framework for the taxation of personal income in the Netherlands.[59] It categorises income into three separate "boxes".[60] The first box, *Box 1*, taxes labour income, self-employment income, imputed rent, pension benefits and other cash transfers. The largest deduction is that for mortgage interest payments related to owner-occupied housing. These forms of income are taxed according to a progressive schedule consisting of four brackets with marginal tax rates starting at 36.55% and reaching 52% for taxable income in excess of 66,422 euros in 2016. Retired individuals face lower marginal tax rates in the first two brackets, since they do not pay the portion of the income tax earmarked for the pay-as-you-go state pension. *Box 2* taxes dividends received and capital gains realised by individuals who own shares in closely-held businesses at a 25% rate. Formally, these forms of income are taxed in Box 2 when a taxpayer's ownership share (and that of his fiscal partner) in a business exceeds 5%. When the ownership share lies below 5%, the shares are taxed in *Box 3*. In addition to these shares, *Box 3* covers savings deposits, bonds, nonowner-occupied real estate, and debt unrelated to mortgages on owner-occupied housing. The net value of these assets and debts is taxed at a flat 1.2% rate, with no further taxation of the associated income.

Indirect taxes The largest indirect tax is the Value Added Tax (VAT), which is codified in the Value Added Tax Act of 1968.[61] The standard rate is 21%, while the reduced rate that applies to specific product categories is 6% in 2016.[62] A 0% rate applies to yet another set of goods and services, partly related to cross-border transactions.[63] A second category of indirect taxes are excise duties, which are imposed on tobacco products, alcoholic drinks and mineral oils,

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[59] The description of institutions in this section reflects their status as of 2016. Sections of this appendix follow the institutional background section in Leenders et al. (2023).

[60] The full text of the Income Tax Act of 2001, effective on January 1, 2016, is available at https://wetten.overheid.nl/BWBR0011353/2016-01-01.

[61] The full text of the Value Added Tax Act of 1968, effective on January 1, 2016, is available at https://wetten.overheid.nl/BWBR0002629/2016-01-01.

[62] These product categories are listed in Table I of the Value Added Tax Act of 1968.

[63] Product categories that face a 0% rate are listed in Table II of the Value Added Tax Act of 1968.

such as petrol and diesel.[64] There are various other taxes such as a motor vehicles tax, a purchase tax on new cars and motor vehicles, environmental taxes, an insurance tax, a real estate transfer tax, a tax on housing corporations, and a bank levy.

Local taxes The most important local tax is a property tax, the rate of which varies by municipality. For residential properties, the rate ranged between 0.0453% and 0.2636% of the property value. The rate for non-residential property ranged between 0.075% and 0.6895% for property owners, and between 0% and 0.1994% for the property occupier (Allers *et al.*, 2016). There are also tourist taxes, waste levies and sewerage charges.

Payroll taxes and mandatory health insurance premiums Payroll taxes are intended to fund health care, as well as to contribute to insurance funds against disability, unemployment and smaller social risks. Employers pay a flat 6.75% payroll tax on wages up to 52,763 euros under the Health Insurance Act.[65] The rate and threshold are set by ministerial decree.

The general unemployment insurance contribution rate is 2.44%, while the sector-specific contribution rate is 1.78% on average. The general contribution rate is set by ministerial degree, and the sector-specific contribution rates are set by the government agency responsible for administering employee insurance schemes.[66] The contribution rate for disability insurance is 5.88%. The rate is set by ministerial decree.[67] These different social contributions all face the same ceiling of 52,763 euros. There are a few smaller payroll taxes related to specific cases of unemployment, child care, and sickness.

Another source of funding health care spending are mandatory health insurance premiums for curative care. The premium level is set by private insurers and in 2016 amounted to an

[64] The full text of the Excise Act, effective on January 1, 2016, is available at https://wetten.overheid.nl/BWBR0005251/2016-01-01.

[65] The full text of the Health Insurance Act, effective on January 1, 2016, is available at https://wetten.overheid.nl/BWBR0018450/2016-01-01.

[66] The full text of the Unemployment Act, effective on January 1, 2016, is available at https://wetten.overheid.nl/BWBR0004045/2016-01-01. The full text of the Funding Social Insurance Act, effective on January 1, 2016, is available at https://wetten.overheid.nl/BWBR0017745/2016-01-01.

[67] The full text of the Disability Insurance Act, effective on 1 January, 2016, the is available at https://wetten.overheid.nl/BWBR0002524/2016-01-01

average of 1,199 euros (Nederlandse Zorgautoriteit, 2016). To compensate individuals with low incomes for this expense, there is a health insurance allowance.

Corporate tax The corporate income tax imposes a progressive schedule on taxable profits, with a 20% rate below 200,000 euros and a 25% rate on profits in excess of that.[68] A special regime exists for profits related to R&D which are taxed at a 5% rate. Dividends received from subsidiaries as well as capital gains realised through the sale of subsidiaries are, under some conditions, fully exempt. There are various deductions such as one for general investment, for energy and environmental investment, as well as the possibility of deducting foreign losses from the corporate tax base in the Netherlands. In general, for (domestic) losses there is a one year carry-back and nine years of carry-forward provision. Finally, the Dutch tax authority may provide advance rulings on the specific application of the corporate income tax.

Inheritance tax Inheritances and bequests are taxed according to a progressive schedule where the rates depend on the relationship between the two individuals involved.[69] For parents transferring wealth to their children, the schedule has two rates of 10% and 20%. In this case, the exempted share of wealth is 20,148 euros in the case of an inheritance and 5,304 euros in the case of a bequest. In addition, there is an exemption for one-off bequests to children between the age of 18 and 39 years old of 25,449 euros for general bequests and 53,016 euros for bequests spent on the child's house. The transfer of closely-held businesses is, under some conditions, treated differently for the purposes of the inheritance tax. The first 1,060,298 euros is entirely exempt and only 17% of the remainder is taxable.

3.9.2. B.2 Government Spending

Health care and long term care Health care and long term care represent the largest public spending category. This type of spending is funded through payroll taxes, insurance premiums, deductibles and, finally, general government revenue. From an international perspective, private contributions are relatively low. A large share of public health spending

[68] The full text of the Corporate Tax Act of 1969, effective on January 1, 2016, is available at https://wetten.overheid.nl/BWBR0002672/2016-01-01.

[69] The full text of the Inheritance Tax Law, effective on January 1, 2016, is available at https://wetten.overheid.nl/BWBR0002226/2016-01-01.

is allocated to longterm care, around 24% of spending, while outpatient care and inpatient care account for 20% and 18%, respectively (OECD, 2024). Pharmaceuticals, medical goods, day-case, home-care and preventive care make up the rest of spending.

Education Education spending is divided between primary (32%), secondary (43%) and tertiary education (25%). Schooling is compulsory for children between the ages of 5 and 16, but most children start school at the age of 4 and a substantial share of children under the age of 4 attends kindergarten and pre-kindergarten facilities (OECD, 2016). The duration of primary education is 8 years. Secondary education is split between 4-year pre-vocational education, followed by upper secondary vocational education, 5-year senior general education and 6-year pre-university education. For those between the ages of 16 and 18, schooling is compulsory until a basic qualification is attained. Tertiary education takes place at universities and universities of applied sciences.

Social support Social support covers different types of expenditure, ranging from allowances for child care to rental support. The allowances for child care depend on income, the number of children, the type of childcare and the number of hours worked. Rental support follows a similar structure of allowances, but depends on income, wealth and rental expenditures. Youth care is available for children and families who experience social or psychological problems. For families with children there are additional benefits called the "child budget" and the "child benefit". The child budget falls with income but amounts to at most 1,038 euros for the first child. The amount is increased, at a decreasing rate, for each additional child. The child benefit depends on the age of the child, but does not depend on income. In 2016, the benefit for a child between the ages of 12 and 18 amounted to 273.89 euros per quarter. Finally, there exists social support at the municipal level, organised through the Social Support Act (*Wet Maatschappelijke Ondersteuning*), targeted at individuals who are unable to independently arrange their own care and support.

Cash transfers The largest cash transfer is the pay-as-you-go state pension, which is paid to all individuals above the retirement age. In 2016, the retirement age increased to 65 and 6 months. The benefit amount is determined by the number of years spent in the Netherlands as well as by one's household type. For a single household, the amount could at most be 1,138.15 euros per month. For a couple, where both have reached the retirement age, the maximum amount was 783.87 euros per person. A second important cash transfer is a minimum income scheme that provides benefits to individuals who have insufficient means to support themselves and who cannot claim other types of income support. As of July 1st, 2016, the minimum income, net of taxes, amounted to 977,15 euros per month for single-person households, and 1,395.15 euros for couples. There are a few smaller cash transfers such as disability insurance, unemployment insurance, and sickness benefits.

3.10. Appendix C Description of Datasets

All datasets are provided by Statistics Netherlands (CBS). The household dataset from Bruil (2023) and the ownership registry known as "SZO AB+" are specifically made available for this project. More information about the sources and methodology of the other datasets can also be found online.[70]

Household dataset from Bruil (2023) We have access to the data sets used in Bruil (2023). For the purpose of our study, the dataset from Bruil (2023) was updated with more recent microdata whenever available and expanded to provide more detail on a number of variables, in particular employers' social contributions, dividends and household wealth. It contains all personal income, along with taxes paid and in-cash and in-kind benefits received for each member of the Dutch population in 2015 and 2016. The totals of the individuals are consistent with the national accounts. Details on the data sources and the distributional assumptions used to construct this data set are in the appendix section of Bruil (2023).

SZO AB+ We obtain the corporate income and tax data from the Satelliet Zelfstandig Ondernemers Aanmerkelijk Belanghouders (SZO AB+), a dataset that is custom-made for this research project by Statistics Netherlands (CBS). SZO AB+ links financial firm data, like balance sheets and profit and loss accounts, to the shareholders of those firms. The dataset covers all shareholders with an interest of at least 5% in a Dutch corporation.

The dataset consists of three files providing (1) financial firm data, (2) ownership links and

[70] https://www.cbs.nl/nl-nl/onze-diensten/maatwerk-en-microdata/microdata-zelf-onderzoek-doen/catalogus-microdata (available in Dutch only).

(3) personal shareholder data. The first two files are based on corporate income tax returns. In corporate income tax returns, there are two types of declarants: individual and fiscal units. For the former, the declaration originates from a single legal entity that is required to file the return. For fiscal units, the declaration is consolidated, which means fiscal information from more than one legal entity (at least two) are combined in one declaration, and those entities are treated as if they are one firm. The first file gives us detailed insight into the calculation of fiscal profit based on the tax return of each firm (both individual and fiscal units), allowing us to precisely determine the amount of corporate tax due, taking into account any type of deductions, exemptions, carry-forward losses or withholding taxes.

The 'ownership links' in the second file allow us to link any firm-level variable such as (retained) profit or corporate income tax to the ultimate natural shareholders. In this file we observe for each firm the percentage of share ownership that is held by its shareholder(s). A shareholder can be either a natural person or a legal entity, and in the latter case we can keep using file 2 to trace back the ownership links just as long as the shareholder is a natural person. Any dividends or capital gains received by those persons are recorded in file 3, which is based on personal income tax declarations.

Gbapersoontab and Gbahuishoudensbus These datasets contains demographic background information on all individuals and households in the Netherlands, such as age, gender and household type.

Inpatab and Inhatab These datasets contain information about income and work, such as labour market status, for all Dutch residents, both at individual and at household level. It is based on administrative records, mostly from the Dutch Tax Administration.

Hoogsteopltab This dataset records the highest educational levels of the Dutch population, covering nearly 11 million individuals in 2016. The records are derived from diverse registers and the Labour Force Survey (EBB).

Budget survey The Budget Survey is a survey on household expenditure among 15 thousand households in 2015. During four weeks, participants record all expenditure on articles and services of 20 euro. During one of those weeks, participants also record expenses on goods and services below 20 euro. The survey distinguishes between 135 types of goods.

Gebwlztab This dataset contains registries of all persons of 18 years and up who have made use of long-term care for which a personal contribution must be paid.

Gebwmotab This dataset contains registries of all individuals aged 18 and up who have made use of social support facilities for which a personal contribution must be paid.

Zvwzorgkostentab This dataset contains, for each Dutch resident who is insured through the basic insurance, their annual costs for health care covered by the basic insurance. The costs refer to those expenses that have actually been reimbursed by health insurers.

Jgdhulpbus This dataset contains all provided trajectories for youth care in a given year, excluding youth protection and juvenile probation.

Kinderopvang This dataset contains all the beneficiaries of childcare allowance, along with the corresponding amount received.

Vrktab This dataset contains for all inheritances for which tax returns have been filed, the inheritance amount, the inheritance tax and the relation between the testator and the recipient.

Schtab This dataset contains for all donations for which tax returns have been filed, the donation amount, the gift tax and the relation between the donor and the recipient.

3.11. Appendix D Methodological Appendix

3.11.1. D.1 Retained Earnings and Corporate Taxes

For the purposes of this study, we are interested in the earnings retained by firms to the extent that Dutch households own shares in these firms. If a firm is located in the Netherlands but has no Dutch shareholders, we want to disregard their retained earnings. Conversely, we do want to include earnings retained by firms abroad if the firm's shareholders are Dutch citizens. The same holds true for the taxes paid by corporations.

First, we focus on earnings retained by domestic firms. In 2016, the primary income of the corporate sector in the Netherlands (B.5n of S.11 and S.12) amounted to 70.3 billion euros. This amount includes the earnings retained by Dutch corporations as well as the earnings retained by corporations abroad owned by Dutch households as part of their "foreign direct investment" (D.43m of S.11 and S.12, 0.7 billion euros). It also includes corporate taxes associated with foreign direct investment in the Netherlands (the part of D.5b of S.11 and S.12 associated with D.43b). To estimate the size of these taxes we rely on disaggregated national accounts that divide the corporate sector in four categories: 1) Dutch-controlled non-financial corporations, 2) foreign-controlled non-financial corporations, 3) Captive financial institutions and money lenders (S.127), and 4) other financial corporations. For each of these subsectors, we observe net primary income (B.5n), reinvested earnings on foreign direct investment (D.43, both incoming and outgoing), and current taxes on income, wealth, etc. (D.5b). We assume that the ratio between corporate taxes and gross retained earnings is the same for foreign direct investment and all other investment within each subsector, but may differ considerably across subsectors. For example, the ratio is equal to 22.4% for Dutch-controlled foreign firms, but 2.7% for captive financial institutions and money lenders which are often used as conduits for multinational profit shifting. This procedure yields an estimate of 8 billion euros for corporate taxes associated with reinvested earnings on foreign investment in the Netherlands. Put simply, this says that firms based in the Netherlands but owned by foreign households as “foreign direct investment” paid 8 billion euros in corporate taxes in the Netherlands, a considerable portion of the 23 billion euros that firms based in the Netherlands paid as corporate taxes.

The remainder, 70.3 − 0.7 − 8 = 61.5 billion euros contains earnings retained by Dutch corporations attributable to foreign portfolio investors. The crucial distinction between direct and portfolio investment is whether an investor owns at least 10% of the shares of a corporation. The Dutch central bank has estimated that the earnings associated with foreign portfolio investment in the Netherlands is equal to 35.5 billion euros.[71] Of this, 24.9 billion euros was paid out in dividends, leaving 10.6 billion euros in retained earnings, net of taxes. To retrieve the gross amount we assume that the ratio between taxes and gross retained earnings is the same for foreign portfolio investment and domestic retained earnings that accrue to Dutch households. This yields a total of 13.9 billion euros in gross retained earnings associated with foreign portfolio investment, 3.4 billion euros of which are taxes. This leaves

[71] This estimate is part of an internal update of a report on the Dutch current account (De Nederlandsche Bank, 2013).

47.6 billion euros for the portion of domestic retained earnings that accrues to Dutch households. Of this, taxes account for 11.5 billion euros.

The above has dealt with earnings retained by domestic firms. Almost as important are earnings retained by firms abroad in which Dutch households hold shares. According to the national accounts, earnings retained by foreign corporations attributable to direct shareholders amount to 0.7 billion euros. This amount is net of taxes. We assume that the ratio between corporate taxes and gross retained earnings is the same for incoming and outgoing foreign direct investment. This yields gross retained earnings on outgoing foreign direct investment equal to 0.8 billion euros, of which 0.1 billion euros are corporate taxes.

More important are earnings retained by foreign corporations attributable to Dutch portfolio shareholders. Again, we rely on an estimate by the Dutch central bank that earnings on portfolio investment shares abroad equal 38.2 billion euros.[72] Of this, 12.7 billion euros was paid out in dividends and 25.4 billion euros was retained. Again this amount is net of taxes. We assume that the ratio between corporate taxes and gross retained earnings is the same for incoming and outgoing foreign portfolio investment. This yields gross retained earnings on outgoing foreign portfolio investment equal to 33.6 billion euros, of which 8.1 billion euros are corporate taxes.

3.11.2. D.2 Production Taxes

We impute indirect taxes using the 2015 Budget Survey from Statistics Netherlands and the 2016 statutory vat and excise rates. The Budget Survey is only available in 2015, so we assume consumption patterns remain unchanged in 2016.

In a first stage we simulate the vat and excise taxes using the Budget Survey data (see Appendix C). Since excise taxes are levied per unit, we infer the quantity consumed by dividing the expenditures by the average price of the goods subject to excises. We use the unique identifier to link the households from the Budget Survey to the disposable household income from the INHATAB income dataset. In a second stage we use the INHATAB income dataset to determine the percentiles of the distribution of disposable household income (variable

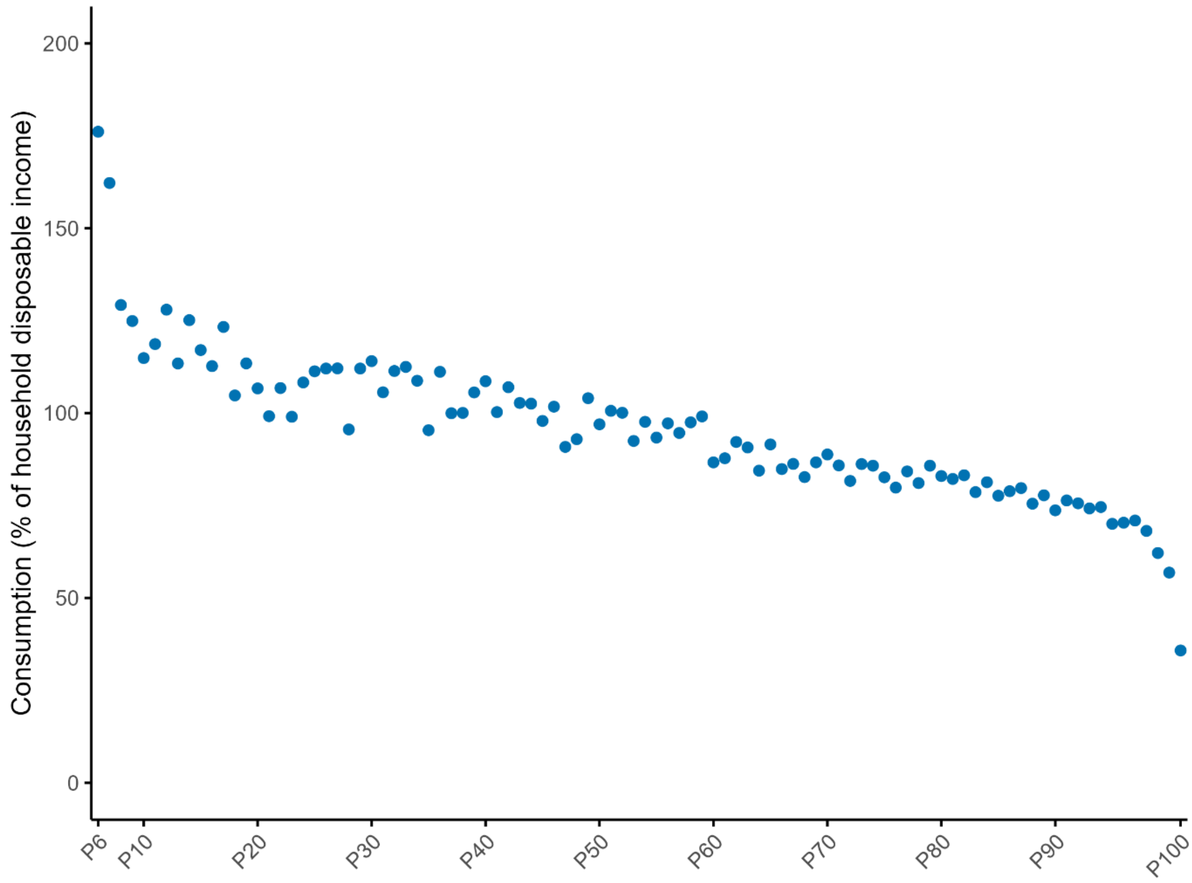
[72] This estimate is part of an internal update of a report on the Dutch current account (De Nederlandsche Bank, 2013).

inhbestinkh) for the whole Dutch population. Figure C.1 shows how the share of consumption by different income groups defines the regressive pattern of consumption taxes observed in Figure A.18: on average, lower-income groups consume (more than) their entire income, while households with higher incomes are able to save and spend a smaller portion of their income on consumption,

In a third stage we calculate the implicit tax rates per income group. To this end, we group the households in the Budget Survey using the percentile values for the household disposable incomes from stage 2 and sum the indirect taxes and disposable incomes. Dividing the former by the latter yields us a tax rate at the level of each income group. In a fourth stage we impute the indirect tax rates into the DINA target dataset, whereby all households within each of the income groups of stage 1 receive the tax rate from the matching income group in the Budget Survey. We then calculate the indirect taxes at the household level by multiplying the tax rate by the disposable household income concept used in the DINA frame, b6g. We set a lower limit of zero (applicable when b6g is negative).

In a final stage, as is done for all other monetary variables, the difference between the indirect taxes in the data and the national accounts aggregate is proportionally allocated.

Figure C.1: Consumption as a share of household disposable income



Note: This figure shows per income group the average share of disposable income spent on consumption. The unit of analysis is the household. Their consumption shares are estimated based on recorded expenses in the Budget Survey.

3.11.3. D.3 In-kind Transfers

Health care In dataset *Zvwzorgkostentab* we observe the costs of health care residents received via their basic health insurance. The national government determines what is covered by the basic insurance, and since the basic insurance is legally required under the The Health Care Insurance Act (Zvw) for almost all Dutch residents, we observe the health care expenses for nearly the entire Dutch population. The difference with the national account aggregate is proportionally allocated.

Education All levels of education are funded by the government. Primary and (general) secondary education is free, secondary vocational and tertiary education institutions do require tuition fees from students. The Education Administration (DUO) provided an administrative data source covering education enrolment. The available information includes a unique student number, type of education enrolled in, institution where education is followed, and the encrypted social security number. We use the enrolment as a proxy for the distribution of the macro total per type of education (nearly 11, 14 and 8 billion euros for primary, secondary and tertiary education respectively), assuming that within each type of education, every student is equally costly.

Long-term care The LTC system in the Netherlands is targeted at people who constantly need (intensive) care, such as the chronically ill, vulnerable elderly or people with a severe mental or physical disability. In *Gebwlztab* we observe whether adults have received any long-term care by means of the Long-term care Act (Wlz) and if so, which type of care. The national accounts aggregate is allocated to all registered users, taking into account cost differences between different types of long-term care on open data.[73]

Social support The Social Support Act (Wmo) requires municipalities to assist people who are unable to independently arrange the care and support they need. This includes services like companionship, day activities and sheltered accommodation for people with psychiatric disorders. In the dataset *Gebwmotab* individuals aged 18 and up who have made use of such facilities are observed.[74] The amount of social support transfers are calculated as follows. Open data[75] on social support expenditure at the national level are linked to all registered individuals who have received some kind of social support. By doing so we obtain an estimation of average cost per type of support, per four weeks. This estimation is used to calculate the costs per individual. The difference with the national account aggregate is proportionally allocated.

Youth care Various forms of youth care exist for individuals up to 18 years old. The Youth

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73 https://opendata.cbs.nl/statline/#/CBS/nl/dataset/82789NED/table

74 Only the facilities for which a personal contribution must be paid are registered. In 2016, municipalities could determine the height of personal contribution themselves, but were also free to grant exemptions, for example for low incomes. As a result, those individuals do not show up in the microdata. We do not know at which scale such exemptions are given. One possible consequence is that we underestimate the average in-kind transfer for lower incomes, since unregistered individuals that did receive support are more likely to be at the lower end of the income distribution.

75 https://opendata.cbs.nl/#/CBS/nl/dataset/84580NED/table

Act requires municipalities to ensure access to youth care and for granting it to young people and their parents.[76] The dataset *Jgdhulpbus* contains all provided trajectories for youth care in a given year, excluding youth protection and juvenile probation. We group all forms of youth care into care with and without residence, after which the average costs for each care type are estimated. Due to lack of expenditure data at the national level, we make use of open data on youth care expenditure of municipalities.[77] Selecting only those municipalities that have registered their expenditure on the two types of care leaves us with data of 52 municipalities, out of 393. By linking these data to registered users of youth care in those municipalities, we estimate the average cost per day for each care type, which we impute to all observed individuals - hence assuming equal average costs for the missing municipalities. The difference with the national account aggregate is proportionally allocated.

Child care The childcare allowance depends on income, the number of children, the type of childcare and the number of hours worked. In the microdata we directly observe the amount of childcare allowance received per household, which we use to allocate the national accounts aggregate.

3.12. References

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[76] We do not take local differences into account, since we aim to show the redistributive effects of in-kind transfers at the national level. In practice however, important redistributive effects at the local level might arise when in-kind transfers differ strongly between municipalities. Since municipalities to some extent are free to shape their social policy, it is likely such local effects do exist.

[77] https://opendata.cbs.nl/#/CBS/nl/dataset/83454NED/table?ts=1630489418255

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Chapter 4

4. Projections to 2025 of the Household Sector within the Dutch Economy

This chapter is based on van Tongeren, J. W., & Bruil, A. (2022). Projections to 2025 of the household sector within the Dutch economy. *The Journal of the Economics of Ageing*, *23*, 100422.

4.1. Introduction

The Netherlands is faced with an ageing population, because of decreasing fertility numbers, and increasing longevity. This demographic pattern is reflected in many economic flows: wages paid to individuals in the working age, pensions received by the retired individuals, educational expenses mainly benefiting the young, and health expenses of the elderly. When demographic patterns of a country change, this impacts on these economic flows as well. In particular, labour-force participation is expected to fall because of ageing, and therefore also saving might decrease. Many fear that therefore, economic growth might fall back as well, with Japan's economy as the ultimate example.

From the macro perspective the System of National Accounts (SNA) offers a tool for economic policy analysis, but this framework does not cover the age dimension and its distributions within the household sector. The methodology of national accounting as reflected in the System of National Accounts (UN, 2009), has been mainly used to analyse economic performance through Gross Domestic Product (GDP). As a measure of welfare, GDP is widely considered to be insufficient, and several authors, among which Stiglitz, Sen and Fitoussi in their influential Report by the commission on the measurement of economic performance and social progress (2009), have recommended to focus instead on household income, and the distribution thereof. When distributions within the SNA are considered, often the focus is on income inequality, led by the work of Thomas Piketty (Piketty *et al.*, 2018) and the World Inequality Lab (Alvaredo *et al.*, 2020). To fully understand the implications of the ageing society, there is also a need for a clear understanding of the age patterns of the economic variables in the SNA.

The concepts of the National Transfer Accounts (NTA) (UN, 2013) were based on those of the SNA (UN, 2008). It was built around the concept of the economic lifecycle, initially addressed by Modigliani & Brumberg (1954). The NTA furthermore shows the different age structures in consumption needs and other economic transactions, allowing for an analysis of well-being benefitting different age groups and different generations.

The goal of the National Transfer Accounts (NTA) is to better understand the generational economy. Much of the research in the field focuses on the direction of inter-age transfer flows and asset reallocations, and on how demographic change affects the magnitude and composition of these flows (Lee and Mason (Eds), 2011). Forward-looking analyses within the NTA framework are typically concerned with the opportunities and challenges that structural population changes pose for economies over time. A dominant theme is the concept of the demographic dividend — the potential economic gains that arise when a country has a growing working-age population relative to dependents. Much of this work focuses on low- and middle-income countries that are still in the early phases of demographic transition and stand to benefit from rising labour force participation (Oosthuizen, 2015; Dramani and Oga, 2017; Mason, 2005). While such simulations offer critical insight into behavioural implications — including how individuals might save more or delay retirement — they typically abstract from macroeconomic constraints such as public budget balance or feasible tax revenues. As a result, projections of rising social benefits or public transfers may overstate their long-term viability when not grounded in the broader national accounting framework, where increases in spending would require offsetting revenues or redistribution elsewhere (Lee and Mason, 2010; Wong and Tang, 2013; Pascual-Saez *et al.*, 2020).

Many forward-looking studies using the National Transfer Accounts (NTA) framework provide valuable insights into how demographic changes affect consumption, transfers, and public expenditures over time. However, most of these analyses operate in partial equilibrium: they project age-specific profiles into the future without embedding them in a broader macroeconomic system. For example, Mason and Miller (2018) estimate future age-specific healthcare consumption for 36 countries through 2060 using NTA and GDP projections, but their approach does not account for how increased healthcare demand might interact with public budgets, labour markets, or sectoral capacity. Similarly, Kuhn and Prettner (2018) explore the generational turnover effect on aggregate consumption growth using NTA consumption profiles, but treat these profiles as fixed, without considering how changes in taxation, wages, or savings might moderate their results. Mason *et al.* (2022) extend NTA projections globally to assess how demographic change will affect GDP growth, savings, and debt burdens, yet their analysis remains largely descriptive and does not impose national accounting constraints or model the behavioural and institutional responses required to maintain fiscal or macroeconomic balance.

These studies highlight the importance of understanding demographic change through the lens of age-specific economic activity.

As a result, while these studies provide critical insights into demographic dynamics, social investment, and inequality, their projections risk overstating what is fiscally or economically feasible. Projections of rising public benefits, for instance, may ignore the required increases in taxation or borrowing, which could in turn crowd out other priorities or create unsustainable trajectories. Embedding NTA-based projections into broader macroeconomic models — as done in more recent work by Sánchez-Romero *et al.* (2019), and Spielauer *et al.* (2022) — allows for policy simulations that remain internally consistent with national budgets, intertemporal government constraints, and labour market feedbacks. These integrated approaches thus offer a critical bridge between age-structured microeconomic insights and the aggregate dynamics of national accounting.

The goal of this paper is to present a methodology for studying the short-term effects of demographic change, using household-level projections of income, consumption, and transfers. Unlike many existing forward-looking NTA applications that treat households in isolation, this approach explicitly anchors these projections within basic macroeconomic constraints—such as government budget balances and aggregate resource limits—to ensure internal consistency and enhance the policy relevance of the results. We analyse how population ageing affects the household sector and the distribution of Household (HH) Disposable Income[78] by age groups. We do this by combining age-specific information based on micro data and demographic data for 2016 with projections of National Accounts data to 2025. By choosing the distribution of HH disposable income *as a measure of well-being*, instead of traditional GDP and its growth, it also follows the recommendations by Joseph Stiglitz, Amartya Sen, and Jean-Paul Fitoussi (2009).

To achieve this, we create an extended National Transfer Accounts (NTA) framework, including not only the traditional SNA tables, but also age profiles for the household sector

[78] As will be explained later, HH Disposable Income refers to HH Adjusted Disposable income including GOV and NPI Social Transfers in kind. Furthermore, it includes Capital Transfers in line with NTA standards to which reference was made above. For the sake of simplicity, we will continue referring to HH Disposable Income.

and the NTA framework with lifecycle and other balances for the analysis of the data. We construct four scenarios for the year 2025 and use a Bayesian estimation approach to arrive at a complete and consistent framework of estimates for each of these scenarios. The four scenarios are to be considered as different consistent views of how the economic variables in our framework might develop in the medium-term. The impact of these scenarios is based on projected fixed values for 2025 of exogenous variables. The exogenous variables included are the values of GDP, total HH disposable income, all GOV sector variables, exports, and population and employment by age groups.

We find that the lifecycle deficit, as defined by the difference between age specific labour income and consumption, of the Dutch household sector worsens for all age groups. For the young this is partly covered by additional transfers received, but all households become more dependent on their assets and savings. To maintain the current level of HH disposable income, wages must rise strongly in all scenarios, and in some cases, part of the tax burden needs to shift to the corporate sector. Our approach differs from most NTA analyses, because we do not project the NTA in isolation, but incorporate the effects in the larger NTA framework, which includes the SNA accounts of production, employment, supply and use and sector accounts of the SNA. This increases, in our opinion, the usefulness of these estimates. Demographic changes will affect the household sector, but through framework links (identities and ratio's) other economic activities and sectors will be affected too, and choices made by other actors in the economy, will change the economic effects of demographic changes as well.

The study is described in subsequent sections of this article. In Section 4.2 the methods and materials used in this study are discussed. These include the frameworks, the Bayesian estimation approach, the scenarios used in the analysis, and the data sources and their reliabilities of the macro and micro HH sector accounts. Section 4.3 presents the analysis of the projections to 2025, based on the four different scenarios. We focus there on the results for the distributions within the household sector, using the alternative format of the National Transfer Accounts framework. Section 4.4 summarizes and concludes. The appendices provide detailed information of the frameworks used, and on the reliability of the Bayesian estimates.

4.2. Materials and Methods

In the foregoing text, reference is made to four elements of our approach, i.e., the data framework, the exogenous variables of the framework used in the scenarios of the analysis, the Bayesian estimation approach used in the compilation and projection of this framework, the difference between the prior data and posterior estimates of the Bayesian estimation approach, and the scenarios that are designed to evaluate the sensitivity of the projections to 2025. Also described here are the data sources on Household (HH) sector accounts that are used in our paper. The framework and the Bayesian estimation method, including the data sources and their reliability and the tests, are described in more detail in the appendices A and B of this document.

4.2.1. Frameworks

The data used in this study are incorporated in a data framework. Such framework may be similar, but not necessarily the same as the SNA accounting framework. The objective and design of the framework bring two elements together: It defines the analysis and identifies the data that are needed in the analysis. Not all data brought together are consistent with each other, because they are based on different data sources. The aim of the framework is to reconcile or integrate the *data* in the framework and arrive at a consistent set of *estimates* that are as close as possible to the data that were incorporated in the framework. This "close" relation between *data* and *estimates* is defined by Bayesian estimation approach described below.

The framework includes seven tables that contain data that are used in our analysis. Through the Bayesian estimation approach these tables are made into a consistent set of estimates.

Four tables are SNA tables, two are supplementary NTA tables, and one is a table linking the SNA to the NTA tables. In the description of the tables only reference will be made to data, but the same set of tables refers to estimates.

The SNA tables are:

1. Production accounts classified by economic activities based on the International Standard Industrial Classification of All Economic Activities (ISIC). The account includes for ISIC category data on output, intermediate and value added. Value added is furthermore broken

down by Compensation of Employees, Taxes on production (and products only for the total economy), Mixed income and operating surplus.

2. Employment accounts include data on employees and own workers, again classified by the same ISIC categories as in the production accounts. Employment is furthermore broken down by age groups. The employment data by age groups juxtaposed population data by age groups, so that indicators can be derived on the rate of employment in the total population, with further details by age groups.

3. A so-called Supply and Use Table (SUT) with classification by products (CPC). This classification uses CPC categories of products that are very close to the ISIC categories used in the previous tables on production and employment. The table compares for each CPC category supply and uses of products. For each CPC category the supply consists of output and imports and the uses of final consumption, intermediate consumption, capital formation and exports. The table also includes adjustments for each of the supply and use categories, so that the total values including the adjustments of each category can be aligned with the corresponding elements for the total economy in the sector accounts presented below.

4. An important SNA table of the framework is the classification of transactions of all institutional sectors of the economy, including the Non-Financial Corporations, Financial Corporations including banks, other financial institutions and insurance schemes, Government, Households (HH's) and Non-Profit Institutions serving HH's, called here NPI's. The totals for these sectors, i.e., the National Economy, are aligned with the totals including adjustments of the SUT on supply and use of products. The data of the HH sector are particularly important for the present paper, as the transactions of this sector directly affect indicators of wellbeing of households as reflected in disposable income and other household variables dealt with in this document.

The two NTA tables include:

5. A summary NTA table, which is based on Van Tongeren in the NTA Manual (2003). It includes in the first-place data on the lifecycle deficit as the difference between Compensation of Employees and HH (SNA actual) final consumption. Also included in the table is the transfer surplus, which is equal to the difference between transfers received and

paid. Furthermore is presented in the table the surplus of capital income minus outlays and minus savings. All items in the table are specified by age groups.

6. A table with a HH sector breakdown by age groups. This table, which is based on micro data, includes for each transaction of the HH sector account a breakdown by age groups. These additional HH sector micro data are not consistent with the macro-SNA data in the previous tables of the extended framework, and therefore need to be made consistent using the Bayesian estimation technique, as described below (Section 4.2.4) and in Section 4.7.1 Appendix B.1.

The tables that link the SNA and the NTA are:

7. Two tables on Final Consumption. The first one is a table cross classifying HH, NPI and GOV final consumption by CPC product categories and COICOP (classification of individuals consumption by purpose) categories in HH surveys. The second table is a cross classification of HH, NPI and GOV final consumption by COICOP categories and age groups. The age groups used in this table are the same as those used in table (6) on HH sector accounts by age groups, and are also the same as those used in the above SNA employment account by age groups (2).

Because the SNA tables are part of an integrated SNA framework for the Netherlands, the different accounts were already reconciled by national accountants of Statistics Netherlands as they relate to each other through identities and through ratios that have been checked. To link the age dimension to the SNA, we follow the analysis embedded in National Transfer Accounts framework. We explicitly link this account to the existing SNA framework, allowing us to analyse the effects of changing demographics in a broader context than the NTA accounts alone. The entire framework is presented and elaborated in detail in Section 4.6 Appendix A.

4.2.2. Exogenous Variables

Exogenous variables play an important role in the framework and in the analysis based on scenarios. They are variables that have fixed value in the 2016 *compilation* and for 2025 their values are *projected* in the scenarios based on assumed trends. The values of the other, so-called, endogenous variables are estimated with help of the Bayesian estimation method (see

Section 4.2.5). The exogenous variables included are the values of GDP, total HH disposable income, all GOV sector variables, exports, and population and employment by age groups.

Population and employment data by age groups are treated as exogenous variables, because they are an essential input into the alternative scenarios studied here, and are an important support of the micro HH sector data included in the present framework. Reliable projections can be made of these variables by demographers of these variables.

GDP was included as an exogenous variable, because it plays an important role in the alternative scenarios. The projection of total GDP to 2025 determines the future development of the Dutch economy, while the effects on its distribution by activities, products and sectors is dependent on the four scenarios that are studied in this document.

The total of exports was included as an exogenous variable to be projected to 2025, as it is a major factor that influences the future development of the Dutch economy. The projections to 2025 of values of GOV sector transactions are treated as exogenous variables, as GOV anti-cyclical policies serve as corrections on the adverse effects of population changes, changes in GDP and changes of exports.

The total of HH adjusted disposable income was selected as an exogenous variable to be projected to 2025, as its per capita equivalent constitutes an important objective of a successful development of wellbeing to be achieved by the Dutch economy. The effects on the distribution of this income by age groups under four scenarios are studied in this document.

While the values of the projected exogenous variables are fixed, the study assesses the effects on distributions within these and other variables of the Dutch economy.

4.2.3. National Transfer Accounts Methods

The methodology of the National Transfer Accounts is laid out in the manual (UN, 2013). We deviate from the described methods in a number of ways. The most important one is that scope of our analysis is the household sector, not the total economy as the NTA suggests. Our reasoning is that the micro data that we incorporate conceptually links to the HH sector of the SNA, not to the total economy. The latter would also require attributing all income and consumption from other sectors in the SNA to the household sector, including net profits of corporations, and the government expenses. The macro totals of these flows are substantial, for instance the disposable income of the (non-) financial corporations' amount to approximately one-third of the disposable income of households. Without any data on the links between the corporations and the households the distribution of this macro amount across age groups would depend entirely on the Bayesian estimation approach. Recently, for the Netherlands, Statistics Netherlands and the CPB Netherlands Bureau for Economic Policy Analysis showed that including the income of the corporate and government sector has a large effect on the level of income inequality (Bruil *et al.*, 2022). They also provided an extensive analysis on the sensitivity of the assumptions, which would apply here as well. In the present analysis the effects on the total economy are measured through identities in the framework.

The difference in scope also comes forward in the treatment of specific transactions of the SNA. Because the VAT in the SNA is not allocated over the institutional sectors of the economy, it is not included in our analysis of the taxes, but included in the consumption patterns. Also, the NTA includes collective consumption of the government sector, which is not attributed to the households in SNA. We adhere to the individual consumption of the household sector only; this can be either private consumption or individualized consumption in-kind.

Furthermore, because our macro framework approach links to SNA concepts more closely than NTA concepts, it has a clear limit in detail when it comes to the estimate of intra-household transfers. Different from the NTA approach laid out in the manual (UN, 2013, p.146-152) we did not include intra-household transfers in our analysis. In the SNA individuals are not an institutional unit, but household are. Households are defined as groups of individuals who pool their income and consume certain types of goods and services collectively. In the NTA this collective form of consumption needs to be allocated over individuals, thus also the financing of the consumption. In case family members have insufficient income to cover their consumption needs, this is covered by other members, to the extent possible. This requires an estimate of all flows of the individuals within the household, fully balanced to SNA or NTA totals. The intra-household transfers can be estimated depending on this information. There are clear downsides to this estimate, because it depends on many assumptions. First of all, certain income and consumption components are only measured on the household level, and the distribution over individuals is arbitrary by nature. Also, the theory of the intra-household transfer might be straightforward when together all individuals within the household have enough funds to cover all expenses, but less so when this is not the case. Most importantly intra-household transfers can only be estimated when micro data is available. While in theory we could determine the intra-household transfers for our initial framework, we argue that a projection of the macro total would be less meaningful, because for 2025 we lack every form of micro data. The downside of our approach is that we should be careful when interpreting the resulting savings of individuals.

Apart from these substantive differences, we further deviate in specific cases from the methods in the manual. Most importantly, we attributed 100% of mixed income to labour income, whereas the NTA manual suggests attributing part of it (one-third) to income from capital, because it is partly a return on investment (UN, 2013, p.93-94). This share is often used when the labour income of self-employed is considered, going back as far as the work of Kravis (1959). However, the distinction between these two items cannot be easily made, and the one-third assumption is an arbitrary choice. Also, it is unlikely that this share will remain stable over time. We prefer to fully allocate mixed income to labour income. We acknowledge that this is just as arbitrary, but we do find this more transparent.

4.2.4. Data Sources used for the Household Sector Breakdown

The prior SNA data for 2016 accounts are constructed using published tables by Statistics Netherlands and can be downloaded from the Statistics Netherlands website. The SNA data used here are compiled by national accountants and are already internally consistent.

The most important addition to the existing SNA framework is the breakdown of the household sector by age groups. We use the Income Panel Survey (IPS) for the age profiles of selected income transactions that are conceptually comparable with the SNA transactions. The IPS describes the composition and distribution of income for individuals and households. It is a sample survey with data from different administrative sources, among which the tax authority. Regarding the use in the national accounts there are some limitations to this data source, which is why we give the breakdowns by age a low quality. These limitations concern different scope in transactions, population, or conceptual issues. The IPS does not cover the consumption of households. For this we used the Household Budget Survey (HBS). The HBS measures the consumption expenditures at the household level, therefore estimates by individuals are unavailable. We allocate consumption to individuals within the households by giving each adult a weight of 1 (one) and each child a weight of 0.8. These factors are derived by us from the equivalence scale as determined by Statistics Netherlands (CBS, 2004).

4.2.5. Bayesian Estimation

In traditional national accounting the derivation of consistent estimates close to the data is done by national accountants largely manually, and adjustments to the data are made by them based on their knowledge of the data. The data could be values of variables or ratio values between variables. This process is called the *compilation* of national accounts. It is a manual approach, in which the national accountants, when adjusting the data, consider various restrictions that estimates should satisfy.

The first restriction of this manual approach is that national accountants consider the quality or *reliability* of data variables. For data that are very reliable, values of estimates of variables should be close to the data values, and for data that are less reliable, estimated values may differ more from the data values. A second restriction is that *ratios* between variables of estimates should approximately hold. For instance, a productivity ratio between the output and labour employed should have a value that is reflected in the data and should approximately hold also for ratios of estimated values. As with data, ratio values between data should not differ much for the estimates if the ratio values of data are reliable. If less reliable the ratio values of the estimates could differ more from the ratio value of the data. A third restriction are the accounting *identities*. Thus, data and estimates on the supply of products based on production and imports, should be equal to the uses of these products in intermediate consumption, final consumption, capital formation and exports. This identity is often not satisfied for data, as they originate from different data sources. For estimates these identities should hold, however. Another example of an identity applies to property income and transfers. An identity that should hold is that the ex post estimated values for the national economy should be equal to the counterpart values in the external accounts. As different data sources, however, are used for the national economy and the external accounts (balance of payments), the identity may not hold for the ex-ante data. Thus, if identities do not hold for the data of variables, the values of estimates of these variables should change, so that for estimates the identities hold.

A similar process of compilation is applied in the present paper to an NTA framework with additional micro data and an analytical indicator based on the recommendations of the UN Manual on National Transfer Accounts. The compilation of this framework, however, is not done manually, but more systematically, based on a Bayesian estimation approach. In this estimation approach, the four restrictions are incorporated in a formal manner. To all data and ratio values prior reliabilities are attached, and identities and ratios between variables are defined in an explicit manner. In particular the number of ratios is much larger than in the manual approach.

The essence of the approach is that the Bayesian estimation method minimizes the sum of the weighted difference between prior and posterior values of estimates and the weight is one (1) divided by the prior standard deviation (reliability) of values of data and ratios.

This Bayesian estimation method closely resembles the traditional SNA compilation approach. It is, however, more systematic, and transparent, and is therefore replicable, in the derivation of consistent estimates in frameworks. Also, consistency of estimates is defined in the framework, in the sense that estimated values of variables satisfy the restrictions of identities and ratio values. The Bayesian compilation method can be applied to all kinds and all sizes of frameworks and is not restricted to SNA type frameworks only. For that reason, the method is applied in the present paper to the variables of data in the NTA framework, which is different from and larger than the SNA framework.

To use the framework in the Bayesian estimation, it does not only include variables of data and estimates, but also ratio values, as well as prior reliability indicators for variables and ratios, and also definitions of identities and ratios between variables that are used in the compilation. These are all elements that are used in the Bayesian compilation, and that are available in the framework.

The methodology is applied not only to integrate the 2016 SNA data with micro data by age groups, but more importantly in this document, to make projections to 2025, for which much less “data are available”. The “available data” are based on assumed projections of population and employment, GDP, exports, counter-cyclical values of GOV transactions. The projection method to the future is the same as that for the past 2016 compilation. The methodology builds further on a Bayesian estimation methodology applied to frameworks of data (Magnus *et al.*, 2000), and to projections (van Tongeren and Picavet, 2016).

4.2.6. Prior and Posterior Reliabilities

Prior reliabilities used in the Bayesian estimation approach are subjectively determined and assigned to the data from the data sources. Posterior reliability refers to the estimates resulting from the Bayesian estimation approach.

The Bayesian estimation methodology results in posterior estimates of variables and ratios, in the compilation and projection of respectively the variables for 2016 (and 2010) and 2025, but and also in posterior reliabilities of those variables. In the compilation for 2016 (and also for 2010) micro data are integrated with the macro data of the national accounts and in the projection to 2025, posterior estimates of all variables are based on a limited number of projected exogenous variables.

The tests referred to in section 4.2 show that the value of the posterior variation coefficient (standard deviation divided by the value, called VARC in appendix B) is much lower than the prior value of this coefficient. The average *prior* value of this coefficient for all variables in the framework is 1.99% and for HH’s 0.0% (including only the reliability of the exogenous variable of HH Adjusted Disposable Income). The average *posterior* VARC is much lower: For the economic SNA framework, compiled by Statistics Netherlands, the posterior VARC is 0.12% and for HH’s, on which this document focuses, it is 0.06%. For the 2016 integrated framework as a whole of macro and micro data the average VARC for the whole framework is 0.19% and for HH’s it is 0.04%. For the projections to 2025 the average posterior VARC for the framework as a whole is approximately 0.22% and for HH’s it is 0.06%.

The conclusion is that integration of data in frameworks of national economic SNA accounts, the integration of macro and micro data and the use of frameworks in the projections of data to 2025 leads to a lower posterior VARC, and thus to improved reliability of posterior estimates. In appendix B it will be shown posterior reliability should not only be measured by the posterior VARC but also by other reliability measures. These include the relative difference between posterior and prior values divided by the prior value, called in appendix B the DIF, and by, what is called here, the information factor, which is the quotient of the number of information items (data, ratio values and identities) divided by the number variables to be estimated. These alternative measures will be discussed in more detail in appendix B (Section 4.7.3).

4.2.7. Scenarios

We analyse the effects of ageing through a projection of this framework to 2025. We use a scenario analysis to show a range of effects. We combine two growth rates of the population with two growth rates of GDP per capita in four scenarios A, B, C and D. In our scenario analysis, household disposable income serves as the central reference variable, growing at an annual per capita rate of 1.8%. This choice aligns with the recommendation of Stiglitz, Sen, and Fitoussi (2009) to focus on household income, rather than GDP, as a more relevant measure of economic well-being. By holding household income constant across scenarios—despite variations in GDP per capita growth—we ensure a consistent basis for analysing how demographic change, particularly ageing, reshapes the distribution of income across age groups. While this approach abstracts from the broader macroeconomic feedbacks of growth on income, it enables a clearer isolation of lifecycle effects.

1. In Scenario A the population increases, following the migration patterns of the years 2000-2016. Thus, in 2025 total population has grown with 641 thousand persons as compared to 2016. This population growth has been combined with a high GDP per capita increase of 2% annually. This is called the "population increase–high GDP per capita growth" scenario.
2. Scenario B is the "population increase–low GDP per capita growth" scenario. The growth of the population is the same as in scenario A, but GDP per capita growth is lower, i.e., 1.6% annually.
3. Scenario C is the "population decrease–high GDP per capita growth". In this scenario population declines slightly (34 thousand individuals), because of immigration rates that fall and are zero from 2021 onwards. Per capita GDP increases with 2% as in scenario A.

4. Scenario D is the "population decrease–low GDP per capita growth" scenario. In this scenario the population decreases as in scenario C, and the GDP per capita increases with only 1.6% as in scenario B.

In all four scenarios, exports are a fixed percentage of GDP. The government sector of the IEA is entirely exogenous. In each scenario an anti-cyclical fiscal policy is implemented, and annualized growth rates are used in line with growth rates found in the recent past.

The projections to 2025 are made within the framework of the National Accounts (SNA), extended with the Micro HH sector accounts by age group and the NTA accounts for the Household Sector. The projections of this framework are tested using projections in the past of 2016, based on 2010 data. In the tests projections from 2016 to 2025 were simulated with tests of projections in the past from 2010 to 2016. The objective was to determine how reliable (posterior reliability) the projections to 2016 were and how much the projections to 2016 differed from the actual values of 2016. Also, with help of the tests were selected a combination of exogenous variables that resulted in the best projections from 2010 to 2016. The tests are described in detail in appendix B (Section 4.7.4) on the Bayesian estimation method.

Unlike many demographic or fiscal sustainability studies that project many years into the future, this study deliberately uses a shorter time horizon of nine years (2016–2025). This choice reflects both the nature of the used methodology. Over shorter time horizons, many of the complex feedback mechanisms and behavioural adaptations—such as changes in fertility, labour supply, migration policy, or household formation patterns—remain limited or absent. For example, if old-age benefits were to fall significantly, one could expect changes in living arrangements, such as elderly individuals cohabiting with their children or delaying retirement. However, such behavioural responses typically unfold over longer time periods and are not modelled in our framework. By focusing on the short term, we can reasonably assume stable institutional settings and isolate the mechanical effects of population ageing on macroeconomic flows, without needing to model adaptive behaviours or anticipate policy reforms.

4.3. Analytical Results of the Study

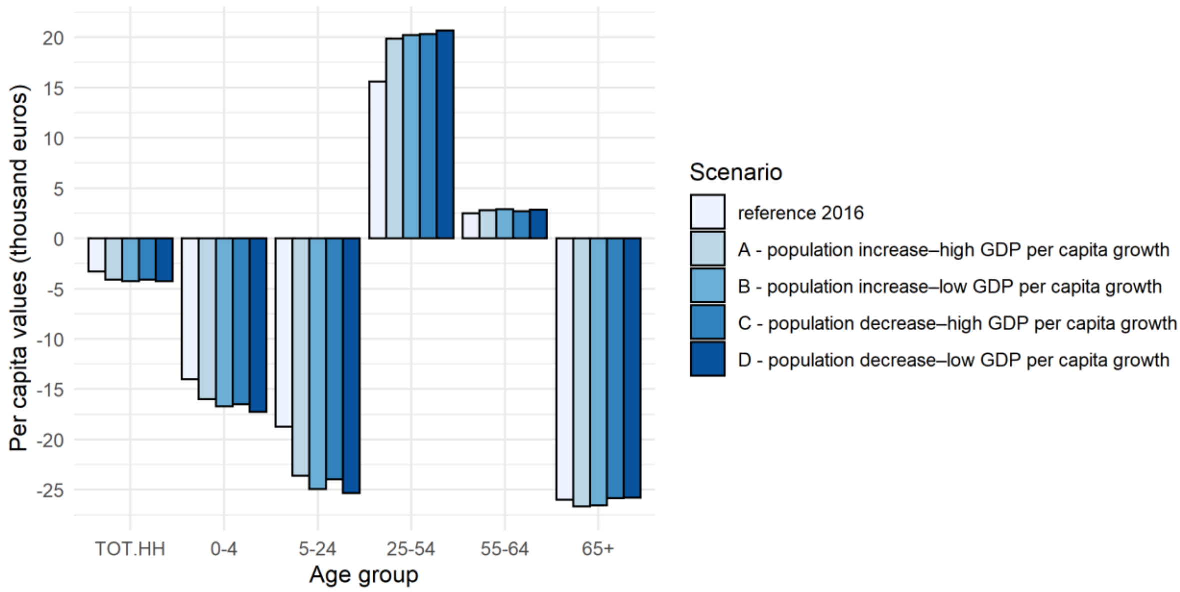
The focus of our analysis is the NTA account G, which is defined within the extended SNA-NTA framework. In this account there are three types of balances, i.e., the lifecycle balance, defined as the difference between labour income and HH consumption, the transfer balance, which is the difference between transfers received and paid, and the net asset balance, which is the difference between capital revenues and outlays. The sum of the three balances is equal to net saving. It should be emphasized here, that even though the analysis focuses on household sector estimates, their 2025 values are estimated within the framework as a whole, in which also data of other sectors of the economy play a role.

In distinct stages of development, the lifecycle consumption needs differ, and the ability to finance those needs differ too. The chosen age groups reflect the different lifecycle stages. From 0-4 children are economically inactive and fully dependent on their parents. The age group 5-24 broadly reflects the years when children are enrolled in education. The working age population starts roughly from 25 years until 65. We identify an additional age group for the population close to retirement (55-64 years). The age group of 65 and older reflects the retired population, even though retirement age shifts upwards. Figure 4.1 shows the lifecycle surplus / deficit (LCD) for the total household sector, and the identified age groups. A surplus means that labour income exceeds the consumption needs for the given age groups. This happens only during the working ages (25-64 years). In all other age groups, there is a lifecycle deficit.

In our scenario analysis, the lifecycle deficit for the total household sector increases (becomes more negative), from -56.4 billion euros in 2016, to -69.7 billion euros in scenario C and -75.3 billion euros in scenario B. We find that the results for the total household sector in the NTA behave similarly towards 2025 for scenarios A and C, and B and D. This is to be expected because those face similar per capita restrictions through, in particular, the fixed value of the exogenous variable of per capita HH Disposable Income.

Our aim is to focus on the distribution within the household sector, these distributions are far less restricted than those for the total HH sector. The age groups 0-4 and 55-64 are the smallest age groups and contribute relatively little to the change in total LCD. The age group 0-4 is economically inactive, but we did allocate consumption to these children. This results in a lifecycle deficit for them. We find that the deficit in the age groups 5-24 and 65+ becomes larger for 2025 as compared to 2016. The total LCD for the 65+ becomes more negative in 2025 for all scenarios, from 80.3 billion euros in 2016 to between 98.1 billion euros (D) and 101.2 billion euros (A) in 2025. This happens because in all scenarios the absolute number of elderly increases. The per capita LCDs however show a slight increase (less negative) for this age group in scenarios C and D to -25.8 thousand euros per capita, but a similar slight decrease in scenarios A and B to respectively -26.7 thousand euros, and -26.6 thousand euros.

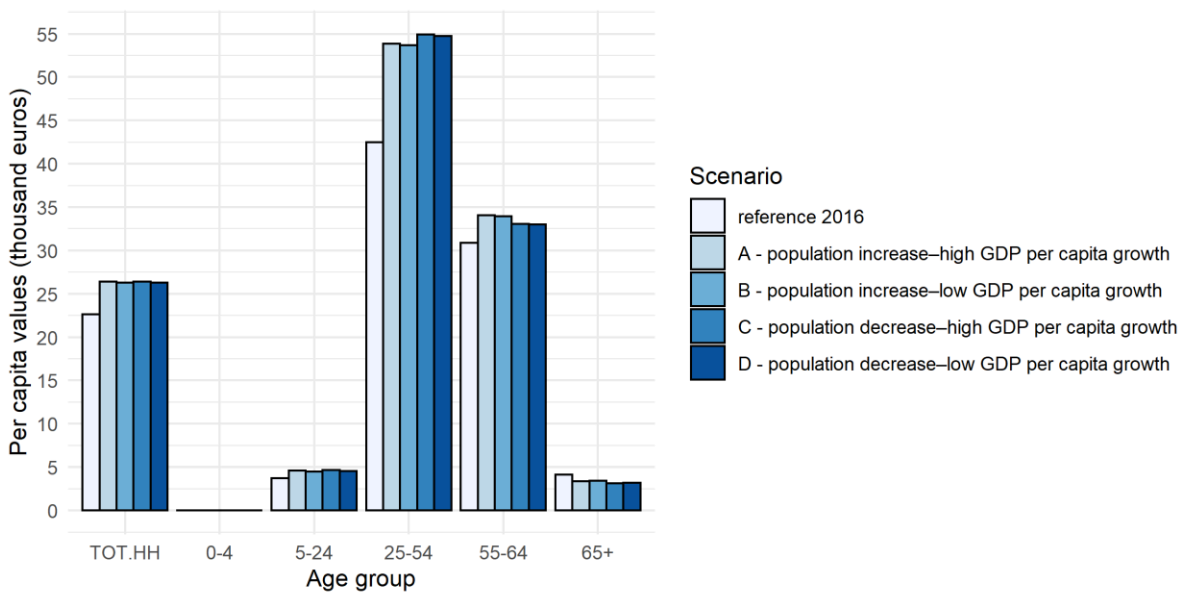
Figure 4.1: NTA lifecycle surplus & deficit



Note: This figure displays the lifecycle surplus or deficit per capita by age group, measured in thousand euros. A surplus indicates that average labour income exceeds consumption for individuals in that age group, while a deficit implies that consumption exceeds labour income. The bars compare four projected scenarios for 2025 against the reference year 2016.

The largest changes since 2016 are found in the age groups 5-24 and 25-54. The surplus of the working age group 25-54 increases both in absolute, and per capita values. The per capita increase is largest in scenario D. In both population projections, also the one where total population increases, this age group becomes smaller. In 2016 this age group consisted of 6.8 million people, which changed to 6.1 and 6.5 million in 2025. The surplus in this age group improves from 105.8 billion euros to between 124.7 billion euros (scenario C) and 131.7 billion euros (scenario B). For the age group 5-24 the deficit becomes worse, where it amounted to -75.1 billion euros in 2016 this decreases further to -88.3 billion euros in scenario C, or even -97.1 billion euros in scenario B. Also, this age group experiences population decline in all scenarios, meaning that the effects on per capita levels are even larger. The biggest change is found in scenario D, where population decreases, combined with a low GDP per capita growth. In that scenario the lifecycle deficit amounts to -25.3 thousand euros in 2025.

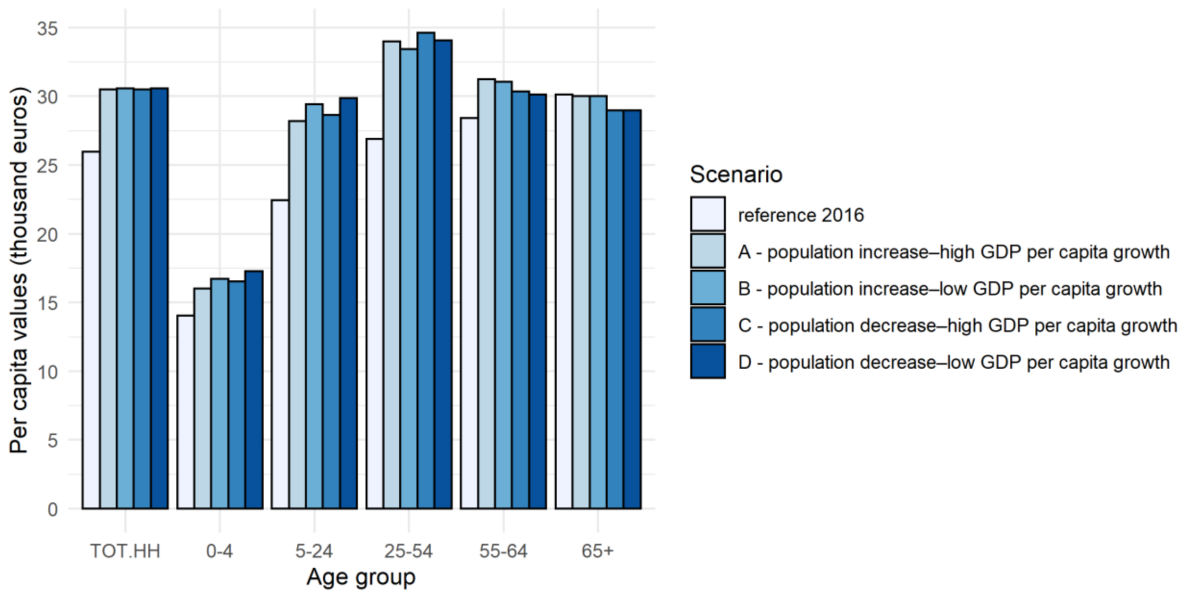
Figure 4.2: Labour income



Note: This figure displays the labour income per capita by age group, measured in thousand euros. Labour income includes the sum of compensation of employees and total mixed income from self-employed. The bars compare four projected scenarios for 2025 against the reference year 2016.

The changes in the LCD are the result of changes in labour income and consumption needs, which are analysed in Figures 4.2 and 4.3. Labour income is defined in the NTA as the sum of compensation of employees and mixed income from self-employed. Following our approach to allocate all of mixed income to labour income, instead of allocating part of it to capital, we overstate labour income when compared to the proposed NTA practice. We feel that for our aim to focus on age distributions within the household sector this is not a disadvantage. Labour income is a large part of Household Adjusted Disposable Income, which is an exogenous variable for the total household sector in all our scenarios. We do find that the effects vary in magnitude per age group (see Figure 4.2). For the age group 25-54 we find that their share in total population becomes smaller, but their labour income increases quite strongly. The per capita changes are highest for this age group, driven by higher wages. In our scenarios, the rise of labour income per worker is largest for this age groups, with annualized growth rates between 2.6 percent (B) and 2.9 percent (C).

Figure 4.3: Individual final consumption

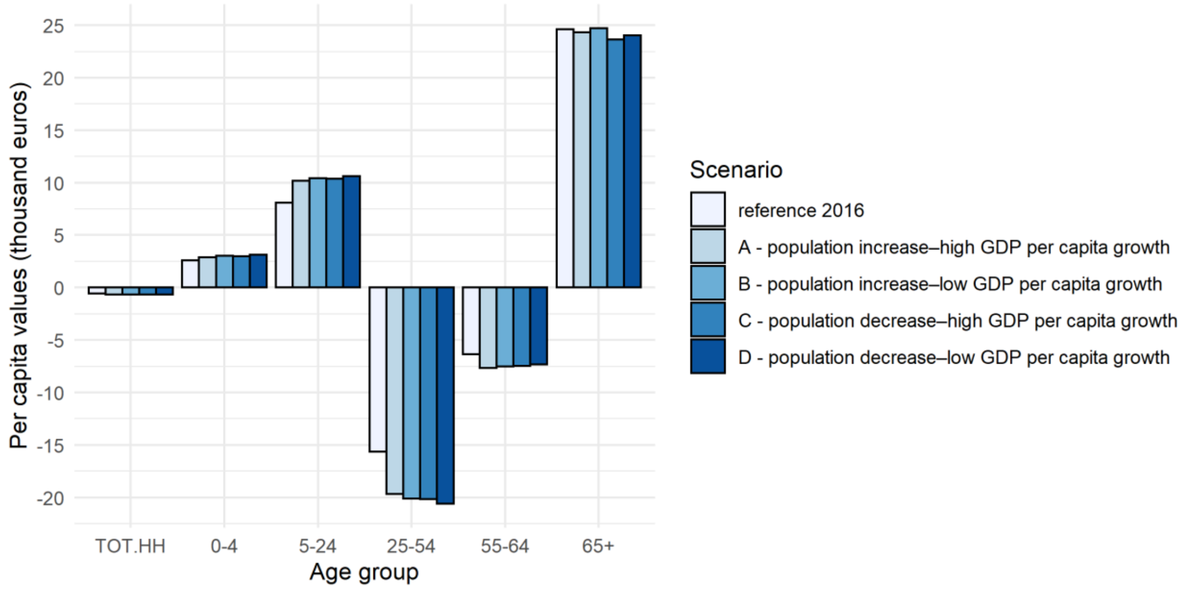


Note: This figure displays individual final consumption per capita by age group, measured in thousand euros. Individual final consumption per capita is derived from household-level values, adjusted using an equivalence scale to estimate the share of each household member. The bars compare four projected scenarios for 2025 against the reference year 2016.

We find that total consumption increases in each age group, relatively most for the 55-64 year old (see Figure 4.3). In our framework this is also influenced by their total income, which increases most as well. On the per capita level, all age groups under 55 years old experience high growth. For the 55-65 year old per capita growth is smaller, but positive. And for the elderly over 65 years old we find lower per capita consumption than in 2016, for all scenarios.

The LCD of the total households sector is expected to grow when societies are ageing, because the deficit of the elderly becomes more influential in the total deficit. This deficit should, by definition, be covered by reallocations. These comprise either current or capital transfers, or revenues from assets, including savings. In the Netherlands, most transfers flow to and from the household sector in relation with the government sector or pension funds. In less institutionalized societies, transfers between households will be more influential. Asset reallocations capture how individuals use accumulated wealth to fund consumption. A higher LCD for a society means a larger dependency on assets or transfers in future years.

Figure 4.4: Transfer surplus



Note: This figure shows the per capita *transfer surplus* by age group under different demographic and economic growth scenarios for 2025, compared to the 2016 reference. The transfer surplus is defined as the sum of taxes and social contributions paid, and social benefits (both cash and in-kind) received. It also includes net current transfers, such as transfers from and to private insurance schemes, inter-household transfers, and transfers involving non-profit institutions serving households (NPISHs).

Transfer surplus is defined as the sum of taxes and social contributions paid, and social benefits (in cash or in kind) received. In the Netherlands, these flows interact for a large part with the government, and the total values for the household sector are thus restricted largely, but not entirely, by our exogenous variables. Also net current transfers are included. The latter include transfers to and from private insurance, but also transfers between households and transfers to and from non-profit institutions serving households. In societies with a less developed social system, it is likely that the private flows are relatively larger. As explained in 4.2 we did not include intra-household transfers in our analysis, which would require an analysis on a micro level, instead of the macro framework we constructed.

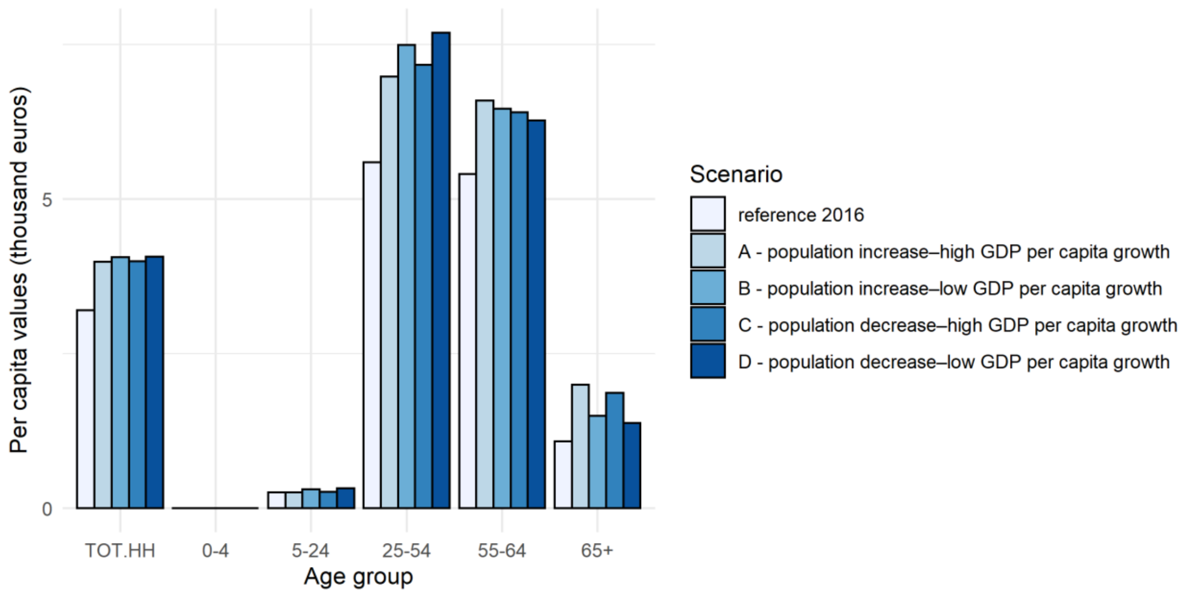
Over time, the total transfer surplus for all ages of the household sector is approximately equal to zero. The government will collect taxes and social contributions up to the point that she can cover the benefits that are paid out. Thus, the net balance will be approximately equal to zero. The results for the total household sector are largely based upon the exogenous variables we identified for the government sector in the IEA. The transfer surplus is a net value and does not differ much between the scenarios (Figure 4.4). Changes are larger when the gross flows are considered. Both taxes and social contributions increase, and so do benefits in cash and in kind.

Given that these transactions in our framework are strongly affected by the exogenous variables of the GOV sector, and that these variables reflect an anti-cyclical pattern for the receipts and payments of the government, we would expect to see the effects here in the transfer surplus of the households. This shows in the GOV account of our macro framework, but not in the NTA. There are two main reasons for this. First, government policy does not entirely end up in the household sector. Taxes are paid by other actors in the economy as well, and we find that in scenario A and C, where taxes are increased relatively much by the GOV, the share paid by the households decreases. In these scenarios, the anticyclical policy burdens the corporations more than the households. Second, the transfer account in the NTA is not solely the result of the government sector. The pension funds are an important actor in the economy, and we find that in all scenarios the transfer deficit increases.

The age group 5-24 has a higher transfer surplus in all scenarios. This increases from 32.5 billion euros in 2016 to between 38.2 billion (C) and 40.6 billion euros (B). This means that they receive more than they contribute. Their benefits consist mainly of social transfers in kind. This group does not yet have a large labour income and hence a low basis for taxation, and they are also less eligible to other social benefits. The social transfers in kind they receive cover their education expenses. Stimulating education, as is done in our scenarios is covered by the social transfers in kind. The financing of this scheme, through taxes, is covered by the working population. For the 25-54 and 55-64 year old, developments are in line with each other. Both age groups have a larger negative deficit, meaning they pay more than they receive. For the 25-54 year old deficit is by far the largest, because this is the larger group in size, and the per capita deficits are largest as well. For this group, the deficit is estimated to be between -124.0 billion euros (C) and -130.8 billion euros (B), which is larger than the deficit in 2016 (-106.0 billion euros). Both taxes and social contributions increase, following the increased labour income. The age group 65+ experiences the largest total increase, from 75.9 billion euros in 2016 to between 89.8 billion euros (C) and 94.1 billion euros (B). This is mainly the effect of the ageing society because the per capita values do not change significantly. Only in scenario B the per capita transfer surplus is slightly higher than it was in 2016, 24.7 thousand euros compared to 24.6 thousand euros.

The second manner to finance the lifecycle deficit is by using income from assets. The net assets-based revenues are the sum of operating surplus, plus the net capital transfers, plus the property income received, minus property income paid. For the household sector the latter is mainly interest paid on mortgages. The operating surplus is the income derived from owner occupied dwellings. Property income received is more diverse, this consists of interest received, dividends, but also the income attributed to insurance policy holders, mentioned earlier.

Figure 4.5: Net Asset Based Revenues



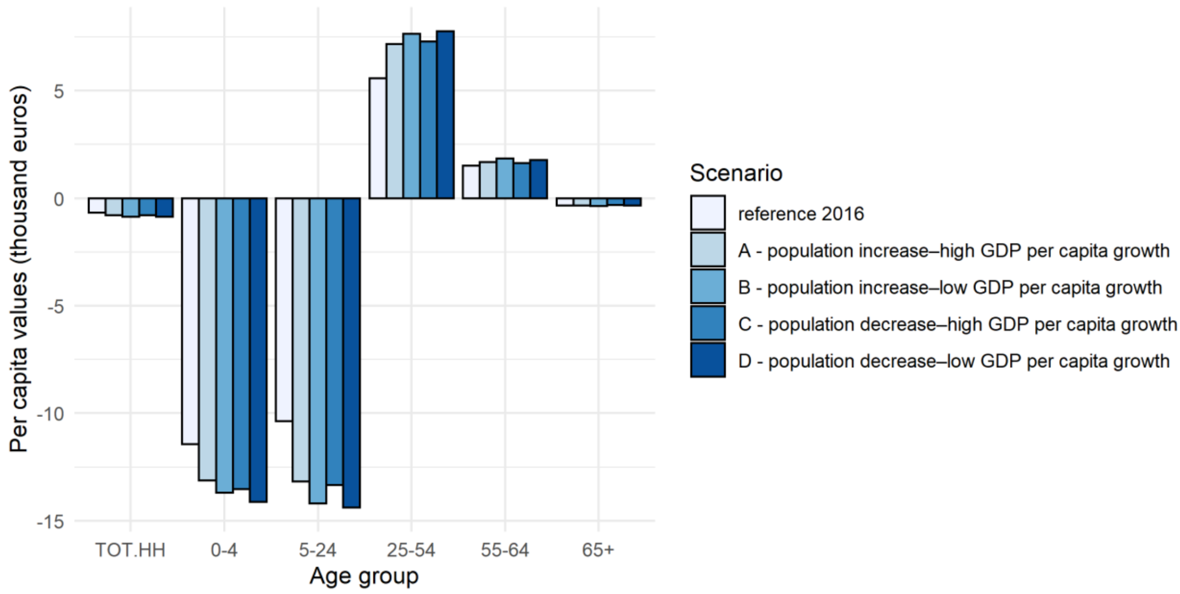
Note: This figure presents per capita values of *net assets-based revenues* by age group across various population and GDP growth scenarios for 2025, relative to a 2016 reference. Net assets-based revenues are calculated as the sum of operating surplus, net capital transfers, and property income received, minus property income paid.

The total asset-based income equals roughly the total LCD of the household sector, however the distribution over age groups is completely different (Figure 4.5). Each age group has positive net income from assets. This might not be true for each individual, but it is true for the selected age groups. For all age groups, and the total household sector, we find a larger dependency on assets. The exception are the youngest individuals, who have not yet accumulated assets, and hence do not derive income either. The dependency of the elderly (65+) on their assets is increasing relatively most. In 2016 net asset-based income amounted to 3.3 billion euros for this age group, in our scenarios this becomes between 5.2 billion euros (D) and 7.6 billion euros (A). Also, when we consider the increasing numbers within this age group, we still see almost a doubling of the per capita values in this last scenario (A).

It is difficult to define a scenario for the development of property income, because this largely depends on interest rates, which we did not project in our framework. We consider this therefore together with savings, which are needed when asset income, or transfers, are not sufficient to cover the lifecycle deficit. Total dependency on savings increases as well (Figure 4.6). In 2016 net savings were -11.6 billion euros. In 2025 this is projected to be between -13.5 billion euros (C) and -15.4 billion euros (B). The largest shifts are found in the age groups of 5-24 and 25-64 year old. The larger dependency on assets and savings might not be a problem for the elderly, because they accumulated assets over their lifetime, and can use them for this purpose. In the Netherlands, the elderly own substantial amounts of assets. The young on the other hand, have had little opportunity yet to accumulate assets, thus this larger dependency might be more problematic. We did not include balance sheets in our framework, but this would be a good opportunity for further research.

The dissaving we find for the youngest age groups (0-4) is the result of our focus on the individual and not the household, and because we excluded intrahousehold transfers from our analysis. Consumption of this age group will be partly covered by social transfers in kind, but private consumption should be covered by the parents in the household. For the young (0-4 year old) intrahousehold transfers are straightforward and can be determined on the macro level, because they do not receive income, and do not have outgoing transfers. When intrahousehold transfers would be included we would see zero savings for the 0-4-year old and lower savings in the higher age groups. As explained in 4.2 we did not include the intrahousehold transfers because we are not able to determine the intrahousehold transfers for the population other than the 4-year-olds. For those age groups intrahousehold transfers cannot be calculated using macro values only but a micro approach would be needed, having information on household composition and individual surpluses or deficits. These results imply that there is a higher demand for intrahousehold transfers from the young, however the extent to which this can be met by their household members cannot be answered.

Figure 4.6: Net Savings



Note: This figure shows per capita net saving by age group across different 2025 demographic and economic scenarios, compared to a 2016 reference. Net saving indicates the extent to which the lifecycle deficit—defined as the gap between consumption and labour income—is fully financed by the transfer system and asset-based revenues. A negative value implies that these mechanisms are insufficient to cover the deficit for that age group.

At this point, it is interesting to see the added value that our extended framework and scenarios provide over the use of a naïve method of projecting age distributions. One could simply take the 2016 age profiles of the household sector, which are used as prior data in our framework, and confront them with the population scenarios to project changes in the aggregate age profiles and macro totals. This would lead to different outcomes, both for the total household sector and the distributions within. The naïve method would find a lifecycle deficit for the total population that would be slightly worse than it is in our scenarios. However, between the age groups the differences are larger. The LCD would be less negative for the young, and more in line with the 2016 results. For the 25-54 year old, the LCD would be less positive.

The biggest difference between our approach, and a naïve method is in the transfer surplus, which for the total economy would be positive, instead of negative as it is in our scenarios, and in 2016. In our analysis, households pay more in taxes, social contributions, and other current transfers than they receive in benefits—although the difference is relatively small. In contrast, the naïve method results in higher transfer receipts for the elderly, which increases total transfers received. However, because the naïve method lacks a budget constraint, it does not account for a corresponding increase in taxes or social contributions—effectively assuming that no one has to pay for the additional benefits. The net transfers paid by individuals in the working ages would be substantially less than in our scenarios. As a result of the positive transfer surplus, the asset-based reallocations for the total economy would have been lower, while savings would remain roughly the same.

4.4. Summary and Conclusion

We constructed four scenarios to analyse the effects of an ageing society, based on a presumed fixed value for 2025 of the exogenous variables of HH disposable income. Thus, the projections to 2025 focus for all scenarios on their impact on the distribution of HH disposable income by age groups. In scenarios A and B population is growing, in C and D it is declining. But in all scenarios, there is an ageing society, meaning that the share of elderly increases. Scenarios A and C are combined with relatively high GDP growth per capita, scenarios B and D with relatively low growth. In all scenarios, households adjusted disposable income experiences the same growth per capita, and the government follows an anti-cyclical policy.

We find that the results for the total household sector in the NTA behave similarly when scenarios A and C, and B and D project estimates to 2025. This is to be expected because those face similar per capita restrictions through the exogenous variables. These scenarios differ only in demographic projections, which are reflected in the distribution of the household totals over age groups. Patterns of financing the lifecycle deficit or surplus, all follow the pattern in 2016. Our scenarios thus did not cause structural shifts. The age groups 0-4, 5-24, and 65+ remain having a lifecycle deficit. Individuals in those age groups have a positive net transfer surplus, but still depend on either borrowing or drawing from their savings. The age groups 25-64 years old continue having a lifecycle surplus, have a negative transfer surplus and positive savings. Net asset-based revenues remain positive for all age groups.

We do find differences in the extent to which age groups respond to the scenarios, which is the focus of our analysis. We find that the LCD of the Dutch household sector worsens, for all age groups. For the young this is partly covered by additional transfers received. The 5-24 year old depend more on transfers. This is the result of assumed increased investment in education to train the future workforce to be more productive. All households become more dependent on their assets and savings. In all scenarios wages rise, and in some cases, part of the tax burden is shifted to the corporate sector.

We incorporated in the extended NTA framework the SNA framework, improving, in our opinion, the naïve method used by others to assess the impact of ageing. This shows up clearly in the case of the transfer surplus. Where the naïve method would turn a negative transfer surplus in 2016 into a positive surplus in 2025, our analysis shows a different picture here. The naïve approach would increase the social transfers received by the elderly because of ageing, but the financing of this scheme does not develop in accordance with that. The scenarios, and our extended framework add relations and boundaries to the naïve method. This does lead to different outcomes, mainly that in our scenarios households become more dependent on assets than would be expected from the naïve method. In the naïve method the transfer deficit turns into a surplus, covering a larger part of the lifecycle deficit.

However, our approach has its limitations as well. First, behavioural effects of households are only included via simple ratios. When households receive more income they will consume more as well, and the reliability of the ratio will determine to which extent the share of consumption will increase or decrease. Also, there are no explicit trade-offs in our framework, other than those needed to arrive at a consistent solution. For instance, we might allow the government sector to entirely cease the social transfer schemes for healthcare, but this does not mean that there are no consumption needs anymore. In case we would do this, we would expect to see a shift from consumption in kind to private consumption, but this mechanism is not explicitly included in our framework, but mainly implicit again through the extensive number of ratios and identities that we defined. We feel that, because we limit ourselves to a medium time frame for our projections, and we did not include large shocks to the economy, these limitations are acceptable for our analysis. The final limitation to be mentioned is that the framework will always find a solution, given the boundaries that we set through identities and ratios, scenarios and also reliabilities. This means that the outcome should be considered carefully and discussed in the context of what is needed to maintain the current level of disposable income. The best example in our results is the wage growth, which is needed to increase labour income for the working age population and allow this group to contribute more to the transfer system.

Our findings that households become more dependent on their savings is consistent with other findings (Mason and Lee, 2007). However, stocks of assets are not included in our system, only flows of income and expenditures. Given that a large part of the net worth of households in the Netherlands is owned by the elderly, our findings do not conflict with that, but the larger dependency on assets might burden the young. Also including the net worth components in the SNA framework would further improve this finding. Also, for further research, the effects of the government interventions could be considered in more detail by looking at the underlying wealth and other features of social schemes instead of limiting ourselves to SNA transactions on flows incomes and expenditures.

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4.6. Appendix A Frameworks

The concept of data frameworks and its objectives were summarized under Materials and Methods of the main text of this document (see Section 4.2). More details, including actual tables with prior data of 2016 are provided in this appendix.

4.6.1. A.1 LIMITED and EXTENDED Frameworks

The framework is presented in two versions, i.e., a LIMITED framework with only economic data, as compiled by Statistics Netherlands and an EXTENDED framework in which also micro HH data, demographic data, and employment data by age groups are incorporated. In the underlying material used in this study, both frameworks are used with prior data for 2010 and 2016. The 2010[79] framework is mainly used to test our methodology of projections, as explained in appendix B on tests. In the tables presented below only reference is made to prior data of 2016. A third framework is the projection framework for 2025. It includes as prior data only projected values for exogenous variables for 2025 and treats in the Bayesian estimation approach the prior data for 2016 as non-available data. Fixed values for the exogenous variables, identities and ratios are then used in the Bayesian estimation approach to estimate the values of the other variables. For the micro HH sector accounts by age groups, 2014 prior data are used as the basis for ratio values. The prior data incorporated in the LIMITED framework are consistent, as they were already reconciled in the compilation by Statistics Netherlands. The prior data of the EXTENDED framework, which includes additional micro HH data by age groups, are not necessarily consistent with macro-SNA data of the LIMITED Framework, because the micro and macro data of the household sector do not fully align with each other, as they are obtained from different data sources. As will be explained in appendix Section A.3 below, the macro HH sector data are mainly indirectly derived by

[79] The 2010 framework is nearly the same as the 2016 framework, with some differences, however. It includes in particular some prior data of the micro accounts, which are not available for 2016 and therefore not included in the tables of the framework presented below. The 2010 framework will not be discussed here in detail.

Statistics Netherlands based on data of other sectors (Financial Corporations, Government and NPI's).

4.6.2. A.2 Content of Cells of the Framework

The LIMITED framework consists of four types of accounts and the EXTENDED framework includes the LIMITED framework plus four additional accounts by age groups. The accounts are linked with each other through identities and ratios or coefficients between the variables of the framework. The prior values of macro variables and ratios of the LIMITED framework are not consistent with those of the micro HH sector data by age groups. By using the Bayesian estimation approach, in which prior reliabilities are attached to the prior values of variables and ratios, posterior estimates of variables and ratios are derived that are consistent between the macro and micro variables. Also, posterior reliabilities are derived that are internally consistent within the EXTENDED framework. Both prior data on variables and ratios, as well as posterior Bayesian estimates of those values are presented in the same format of the framework.

The accounts are described separately below and illustrated with 2016 data, as this is the main data set of our study of the past and the projections to the future. For the micro HH sector accounts by age groups prior data of 2014 are used. They are consistent with those of the 2010 framework, and thus can be used in the test of our 2025 projection methodology, as will be explained below.

The main group of cells in the accounts refer to variables and distinguish between those with prior data (cells coloured green in the tables of appendix A that are used in the Bayesian estimation, and cells with prior data that are not used (coloured yellow in the tables of appendix A). The green cells with data refer to variables that are derived from independent external sources. To all green variables prior reliabilities are attached. Included in this group are the exogenous variables, which were described in 4.2. They include GDP, exports, population, and employment by age groups, all GOV accounts transactions, and also HH Adjusted Disposable Income including Capital Transfers. They are assigned a Fixed (F) reliability in the accounts of the framework. i.e., prior and posterior values are the same. Posterior values may differ from prior values for all other green coloured variables. Other colours are used in the framework for identities and ratios. Ratios include not only those between green variables, but also those between yellow variables, and between yellow and green variables. All identities and ratios are included in the framework but are not shown in the tables presented below. As they include, however, essential information on Bayesian restrictions that posterior estimates should satisfy, they are referred to in the text below, accompanying the tables. They are also discussed in Appendix B (B.3), which includes details on the model behind the framework, in which identities and ratios play a key role. Sources and prior values of variables and also ratios are described in appendix B (B.5) on data sources.

The prior data of the yellow cells are ignored in the Bayesian estimation, but identities and ratios between yellow-coloured variables are included in the framework (Van Tongeren, 2011). They refer to transaction items that can be derived from other items, and other approximate values, for instance for variables that are based on the values of other year's data, or variables of which the prior values are derived from other prior values. No prior reliabilities are available for the yellow cells. Most yellow-coloured variables are those for the total economy, which can be derived by adding the values for each sector, industry, or product. Also included in this group are most micro HH data by age groups in tables B on population and employment, F on micro HH sector data and G on NTA variables, as for those variables generally only indicators from HH variables between HH age groups.

For the projections to 2025, the same framework is used as a projection framework. Implicit in the projections to 2025 of the prior data of 2016 is a model similar to what is used by *econometricians* when making projections. The model as described in appendix B (B.3) is not only used in *projections* to 2025, but also in the *compilation* of reconciled estimates based on macro and micro data. While the data items, ratio values and identities together with reliabilities serve in the framework to *compile* the best estimates for the past, the same items serve in the projection framework with presumed conditions of ratios, identities, and prior reliabilities to *project* estimates to the future. The analysis of projections in Section 4.3 are based on these projections. They use fixed values (prior reliability F) for exogenous variables and adjusted Bayesian estimates of all other variables and ratios.

4.6.3. A.3 Accounts of the Framework

The LIMITED Framework includes the traditional accounts of the SNA, which are also compiled by Statistics Netherlands. They include the Production Accounts by economic activities, the

Employment Account also by economic activities, the Supply and Use Table (SUT) with data classified by product categories, and the Integrated Economic Accounts (IEA) with a classification of data by institutional sectors. The prior data of these accounts are directly derived from the Netherlands SNA accounts and are thus already integrated or made consistent by national accountants. The basic underlying data sources are described in appendix B (B.5), with indications of the prior reliabilities that are assigned to the prior macro-SNA and micro HH sector data used in the Bayesian estimation approach.

The EXTENDED framework includes the accounts of the LIMITED framework, to which are added four accounts by age groups, i.e., HH, GOV and NPI final consumption by functional or purpose categories and age groups, and also cross-classified by functional and product (CPC) categories, micro HH sector accounts by age groups, and population and employment data by age groups. These include prior data that are not used by national accountants in their integration process and are therefore not necessarily consistent with the prior data of the LIMITED framework. Also included in the EXTENDED framework are the NTA HH sector accounts by age groups, which are alternative to those of the SNA, and therefore also not used by national accountants.

A summary of the accounts was provided in Section 4.2.1, and more detail will be presented below on cells with data, ratios, identities, and prior reliabilities of values of data and ratios. The three tables A (Production Account), B (Employment Account) and C (Supply and Use Table) are presented together below. Due to space restrictions, tables are shown in multiple parts.

Production accounts by economic activity (ISIC), in current prices (tables A)

Table A, the Production accounts by economic activity (ISIC) in current prices, is the part of the LIMITED SNA framework that defines the variables that represent macroeconomic aggregates and details on the production side. It includes variables on output in the first row, value added in the third row and compensation of employees and operating surplus in the fourth and sixth row. The last column on "Production of goods and services n.e.c" includes correction items, that refer to output of products that is measured but cannot be assigned to any intermediate or final use and is therefore treated as intermediate consumption of the same activity. This activity has therefore no value added.

All items of output, value added, etc. by activities are based on independent information from, among others, the Business Statistics and are therefore coloured green. The only yellow-coloured variables in this table are the totals of output and value added components, which are derived as the sum for all ISIC activities, and therefore do not include independent information.

Important *ratios*, included in the framework and used in the Bayesian estimation, but not shown in the table, are the i-o coefficients by ISIC categories between value added and output, coefficients of the components and the total of value added, on compensation of employees, operating surplus and production taxes value added and by ISIC categories, and also the ratio for each ISIC category between output by products (CPC product category in table C) and ISIC category. Also included are the distribution coefficients between each ISIC and the total value added. Another coefficient is the ratio between ISIC activity output in table A and CPC product output in SUT table C. The latter measures the extent to which each ISIC category produces its characteristic and non-characteristic products. The *identities* include the “vertical” definitions (in the columns) of value added and operating surplus for each ISIC category of activity, and also the “horizontal” identities (in the rows) between the sum of all ISIC categories and the total of output and value added.

Employment and Population by age and economic activity (tables B)

Account B, Employment and Population by age and economic activity (ISIC), is the second table below. It provides the link between macro data on production of account A with the micro data on population and labour income by age groups in account F, presented below as part of the EXTENDED Framework. The classification of employment is the same ISIC breakdown as used in the Production Accounts of account A. There are two breakdowns of employment in this table: the first breakdown is by age groups and the second one by employees and own account workers. The breakdown by age groups is used in the EXTENDED and not in the LIMITED Framework.

Total employment for each ISIC category is presented in the first row of the table and these totals correspond both to the sum of all age groups and also to the sum of employees and own-account workers. The totals for the economy as a whole are presented in the first column of the table. The table also includes the exogenous

Table 4.1: Account A, part 1

	A-U All economic activities	A Agriculture, forestry and fishing	B Mining and quarrying	C Industry	D Electricity and gas supply	E Water distribution and Waste treatment	F Construction	G Wholesale and retail trade	H Transportation and storage	I Accommodation and food serving	J Information and communication	K Financial institutions
Output, basic prices	1,318,197	29,791	13,014	299,469	16,521	9,456	89,605	153,202	75,629	24,862	62,716	72,721
Intermediate consumption	687,165	18,248	4,105	222,821	9,615	5,705	59,640	63,358	43,871	12,524	32,463	28,346
Value added	631,032	11,543	8,909	76,648	6,906	3,751	29,965	89,844	31,758	12,338	30,253	44,375
Compensation of employees	339,804	2,903	1,074	40,478	1,825	1,841	16,599	44,602	17,592	6,241	15,910	19,430
Other taxes less subsidies on production	3,919	-526	16	-133	158	7	51	174	163	219	-168	1,649
Operating surplus, gross	287,309	9,166	7,819	36,303	4,923	1,903	13,315	45,068	14,003	5,878	14,511	23,296

Note: This table presents part 1 of the production accounts by economic activity (ISIC) for the year 2016, expressed in current prices (million euros). The rows follow the International Standard Industrial Classification of All Economic Activities (ISIC). Values highlighted in green are based on independent data, whereas those in yellow are derived or the result of other data. In this table the column A-U is the sum of all other columns and thus colored yellow.

Table 4.2: Account A, part 2

	L Renting, buying, selling real estate	M Other specialised business services	N Renting and other business support	O Public administration and services	P Education	Q Health and social work activities	R Culture, sports and recreation	S Other service activities	T Activities of households	U Extraterritorial organisations	Production of goods and services n.e.c.
Output, basic prices	79,325	98,616	66,076	74,434	40,664	83,015	15,668	12,866	547		1,704
Intermediate consumption	41,445	47,327	22,234	28,656	8,476	26,130	6,998	5,203	0		1,704
Value added	37,880	51,289	43,842	45,778	32,188	56,885	8,670	7,663	547		0
Compensation of employees	3,571	32,494	25,761	31,201	24,686	44,892	3,699	4,458	547		0
Other taxes less subsidies on production	3,934	-1,227	295	390	221	-1,363	46	13	0		0
Operating surplus, gross	30,375	20,022	17,786	14,187	7,281	13,356	4,925	3,192	0		

Note: Note: This table presents part 2 of the production accounts by economic activity (ISIC) for the year 2016. This should be read together with part 1, and are the remaining columns.

Table 4.3: Account B, part 1

	A-U All economic activities	A Agriculture, forestry and fishing	B Mining and quarrying	C Industry	D Electricity and gas supply	E Water distribution and Waste treatment	F Construction	G Wholesale and retail trade	H Transportation and storage	I Accommodation and food serving	J Information and communication	K Financial institutions
Total	8404	176	11	816	33	34	405	1280	383	373	280	270
0-4												
5-14												
15-24	1256	32	0	76	2	2	26	385	39	184	25	10
25-45	3479	48	6	323	15	13	190	453	145	106	164	132
45-54	2080	49	3	245	9	11	116	272	107	50	65	83
55-64	1409	39	2	162	7	7	68	146	80	29	24	40
65+	180	8	0	10	0	1	5	24	12	4	2	5
Employeees	7000	75	11	761	32	33	277	1099	349	312	214	224
Own-account workers	1403	101	0	55	1	1	127	181	34	62	67	47

Note: This table presents part 1 of the employment data of employees and own-account workers by age group and economic activity (ISIC classification) for the year 2016. Employment figures are expressed in thousands (×1000). Cells highlighted in green are based on independent data sources, while yellow cells represent values derived or estimated from other components.

Table 4.4: Account B, part 2

	L Renting, buying, selling real estate	M Other specialised business services	N Renting and other business support	O Public administration and services	P Education	Q Health and social work activities	R Culture, sports and recreation	S Other service activities	T Activities of households	U Extraterritorial organisations	Production of goods and services n.e.c.	Population by age groups
Total	66	591	462	489	572	1328	174	183	11	1	464	16,979
0-4												877
5-14												1,923
15-24	3	42	91	20	41	115	35	19	1	0	107	2,085
25-45	30	287	212	199	255	586	67	75	3	1	167	4,218
45-54	20	151	96	148	131	341	36	47	4	0	95	2,567
55-64	11	89	55	117	132	269	28	35	2	0	68	2,224
65+	2	22	8	5	13	17	8	7	1	0	27	3,085
Employeees	53	370	390	481	507	1193	105	108	9	1	393	
Own-account workers	13	221	72	7	65	133	69	75	2	0	71	

Note: This table presents part 2 of the employment data of employees and own-account workers by age group and economic activity (ISIC classification) for the year 2016. This should be read together with part 1.

Table 4.5: Account C, part 1

		Total of products	01-03 Products of agriculture, forestry and fishing	06-09 Petroleum, natural gas and other mining products, services	10-33 Manufacturing products	35 Electricity, gas, steam..	36-39 Natural water and waste treatment	41-43 Construction works	45-47 Trade services	49-53 Transport, warehousing and postal services	55-56 Accomodations and food serving	58–63 Information and communication services	64-66 Financial services	68 Real estate services	69-75 Other specialized busines services	77-82 Renting and other busines support services	84 Public administration and services	85 Education services	86-87 Human health and social care services
Output, basic prices		1,137,104	27,665	13,107	274,707	12,678	14,337	92,549	10,965	59,574	26,178	62,489	67,324	83,241	97,243	82,661	70,514	34,264	80,321
Imports		473,015	20,457	30,978	317,984	947	2,766	1,429	0	9,040	872	8,050	4,336	15	28,628	46,414	44	78	0
Total supply at basic prices		1,610,119	48,122	44,085	592,691	13,625	17,103	93,978	10,965	68,614	27,050	70,539	71,660	83,256	125,871	129,075	70,558	34,342	80,321
Changes in inventories	incl. valuables	870	-97	-501	1,221	0	2	0	0	0	0	7	0	0	0	0	0	0	0
Exports		553,160	26,835	19,140	389,278	831	4,293	2,581	0	25,122	0	12,523	4,739	15	23,466	43,206	740	52	0
Final consumption expenditure	HH's, CPC	277,045	6,603	4,352	94,112	4,613	2,753	435	4,245	6,932	23,009	12,324	16,526	56,173	2,771	11,708	1,431	3,415	12,040
Final consumption expenditure	NPI (individ), CPC	5,316															93		
Final consumption expenditure	GOV, CPC, collective	56,378	0	24	5,322	10	2,505	402	0	411	71	0	0	1,394	317	421	66,259	28,127	19,759
Final consumption expenditure	GOV (indiv.), CPC	110,854												2,221			31,048	28,954	44,141
Fixed capital formation, gross		112,878	233	503	37,727	97	0	45,838	0	0	0	9,701	480	1,728	14,286	1,906	379	0	0
Intermediate consumption		648,865	26,954	26,054	201,024	9,870	8,035	44,703	6,720	34,763	3,970	38,154	52,380	21,720	87,238	71,831	1,656	2,748	3,867
Total use at purchaser's prices		1,771,283	60,528	49,572	728,684	15,421	17,588	93,959	10,965	67,228	27,050	72,709	74,125	83,251	128,078	129,072	70,558	34,342	79,807

Note: This table presents part 1 of the Supply and Use Table (SUT) by product classification (CPC), expressed in current prices (million euros) for the year 2016. Cells highlighted in green reflect values derived from independent data sources, while yellow cells represent estimated or derived figures based on balancing procedures or related data inputs.

Table 4.6: Account C, part 2

		90-93 Arts, culture, sports and recreation services	94-96 Other services	97 Services of households as employers	99 Extraterritorial organisations	Goods and services n.e.c.	Cif/fob adjustment	Cif/fob reclassification	Consumption by residents abroad	Consumption non-residents in the country	Contract wages, finishing, trade service	Imputed VAT	Difference imputed and paid VAT	Other goods n.e.c.	Other services n.e.c.	Sales of existing fixed assets	Trade and transport margins	SUB-TOTAL adjustments	TOTAL, including adjustments
Output, basic prices		13,965	12,775	547	0		0	0	0	0	25,622	0		22,270	0	0	134,905	182,797	1,319,901
Imports		634	343	0	0		-3,043	6,492	13,193	0	12,476	0		0	3,293	0	3,035	28,954	501,969
Total supply at basic prices		14,599	13,118	547	0		-3,043	6,492	13,193	0	38,098	0		22,270	3,293	0	137,940	211,751	1,821,870
Changes in inventories	incl. valuables	238	0	0	0		0	0	0	0	0	0		0	0	0	0	0	870
Exports		212	127	0	0		-3,043	0	0	12,697	14,991	0		0	0	1,512	0	26,157	579,317
Final consumption expenditure	HH's, CPC	7,857	5,742	4	0		0	0	13,193	-12,697	0	25,432		1,102	0	1,301	0	28,331	305,376
Final consumption expenditure	NPI (individ), CPC	2039	3184																5,316
Final consumption expenditure	GOV, CPC, collective	978	244	543	0		0	0	0	0	0			0	0	0	0		62,828
Final consumption expenditure	GOV (indiv.), CPC	4,490										533						533	110,854
Fixed capital formation, gross		0	0	0	0		0	0	0	0	0	10,520		19,464	0	-2,813	0	27,171	140,049
Intermediate consumption		3,365	3,813	0	0		0	0	0	0	23,107	11,900		1,704	3,293	0	0	40,004	688,869
Total use at purchaser's prices		14,689	13,110	547	0		-3,043	0	13,193		38,098	48,385		22,270	3,293		0	122,196	1,893,479

Note: This table presents part 2 of the Supply and Use Table (SUT) by product classification (CPC), expressed in current prices (million euros) for the year 2016. This should be read together with part 1. Cells highlighted in green reflect values derived from independent data sources, while yellow cells represent estimated or derived figures based on balancing procedures or related data inputs variables with fixed prior values of employment by age groups in the first column, and population by age groups in the last column of the table.

Most variables of the employment and population table are coloured green, as the data are from administrative data source. The only exception are the totals in the first row, which derived from the details of employment and population by age groups and employment by employees and own account workers in the table.

The ratios include among others the "vertical" coefficients of distribution of employment and the population by age groups, and the breakdown of employment between employees and own account workers, as well as the coefficients of distribution of total employment for each ISIC group

Two important ratios in the table are based for each ISIC group on the relation between this table and table A of the production accounts. These are the productivity ratio between output and employment and the average compensation of employees per worker. Other important ratios are those between the total employment and population and by age groups.

The identities are between the "vertical" variables of total and employment by age groups, and "horizontal" variables by ISIC groups of total and employment by ISIC categories.

Supply and Use Table (SUT) of products by CPC (tables C)

Table C, the SUT, is based on a variety of data sources (see appendix B.5). It is the central table for product data, in which the variety of product data from various sources are reconciled. It is linked on the one hand to table A of the production account, and on the other to the final consumption accounts D1 and D2 of HH's, GOV and Non-profit Institutions serving Households (NPI). All data in this table are classified by CPC product categories that closely correspond to the ISIC categories in accounts A and B. It includes data on the supply in basic prices, i.e., output and imports by products, and on uses in purchasers' prices, i.e., final consumption of HH's, NPI's, GOV (individual and collective) and gross fixed capital formation, changes in inventories and exports. The links between the two types of valuations are the adjustment items on the right-hand side of table C (part 2). The totals for the national economy before adjustments are included in the first column of table C (part 1) and the totals for the national economy after adjustment are presented in the last column of the table C (part 2).

All data in the rows from different data sources are coloured green as they are based on independent data. Totals of supply and use in the rows and also the totals for economy as a whole with and without adjustments (columns 1 and 37) are coloured yellow, as they are derived data. Also, the output row is coloured yellow as these data are derived from those of table A on production accounts.

The ratios defined in the table are the "vertically" defined ratios for each product group between total and components of supply and use in the rows. Also are defined the "horizontal" coefficients of distribution of supply and use components in the rows between product groups in the columns. The "vertical" identities are those in the columns between the totals and components of supply and use. The "horizontal" identities are those between the totals and the sum of product details in the rows, as well as identities between data in the SUT and comparable data in table E of the macro-IEA (Integrated Economic Accounts, see below) and table A on the production accounts.

Macro Integrated Economic Accounts by Sectors (tables E)

Table E is the last table of the LIMITED framework. It includes the accounts for all institutional sectors and the ROW. It includes the HH sector accounts, which is the most important account for the present analysis. The sector accounts summarize in a different format the production accounts A and major aggregates of the SUT account C, i.e., output, intermediate consumption, imports, and exports, HH, GOV and NPI final consumption, gross fixed capital formation and changes in inventories. It derives for each sector the balancing items of operating surplus, primary income (and national income), disposable income, saving, changes in net worth due to net saving plus capital transfers, and net lending.

Because all data of sectors, except for the HH sector, are based on independent survey or administrative data sources obtained from the units included in those sectors, data of all sectors, except the HH sector, are coloured green, including balancing items.

The totals for the national economy are presented in the first column of the table and coloured yellow, as they are derived as totals for all sectors in the columns. All balancing items are also coloured green, except adjusted disposable income, net and adjusted disposable income, net, incl. Capital Transfers, which are considered as dependent variables that are derived from other variables based on independent data sources.

The variables of the HH sector are considered as residuals in the Bayesian estimation approach and therefore coloured yellow. While this information is “known” to Statistics Netherlands, it is not directly used as priors in the Bayesian estimation. This is in line with the compilation method used by Statistics Netherlands, which relies heavily on residual estimates of the HH sector, as is explained in the data sources below. An exception to this is the exogenous variable of HH Adjusted Disposable Income including Capital Transfers. The prior information of this variable is used as an independent exogenous variable in the Bayesian estimation and assigned a fixed value. Other exogeneous variables in table E are GDP and total Exports; those variables are coloured green, as well as HH Adjusted Disposable Income including Capital Transfers.

The “vertical” ratios and identities that are included in the framework (but not shown in table E) are those for each sector between the totals and components of output and value added, disposable income, and social contributions and benefits. “Horizontal” distribution ratios (coefficients) and identities are defined between transactions of individual sectors and the green coloured totals for the national economy in the first column of the table.

Table 4.7: Account E, part 1

	S1 Total Economy (TOT)		S2 Rest of World (ROW)		S11 Non-Financial Corporations (NFC)		S12 Financial Corporations (FC)		S13 General Government (GOV)		S14 Households (HH)		S15 Non-Profit Instutions Serving Households (NPI)	
	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements
EXTERNAL GOODS AND SERVICES														
Imports	0	0	501,969	0	0	0	0	0	0	0	0	0	0	0
Exports	0	0	0	579,317	0	0	0	0	0	0	0	0	0	0
External balance of goods and services				-77,348										
PRODUCTION ACCOUNT														
Output, basic prices	1,319,901	0	0	0	944,983	0	71,981	0	124,927	0	171,060	0	6,950	0
Market output	1,145,820	0	0	0	935,344	0	71,132	0	6,928	0	131,749	0	667	0
Financial intermediation service (FISIM)	32,202	0	0	0	0	0	32,202	0	0	0	0	0	0	0
Other market output	1,113,618	0	0	0	935,344	0	38,930	0	6,928	0	131,749	0	667	0
Output produced for own final use	55,636	0	0	0	9,639	0	849	0	5,814	0	39,311	0	23	0
Own-account capital formation	17,538	0	0	0	9,639	0	849	0	5,814	0	1,213	0	23	0
Products retained for own consumption	38,098	0	0	0	0	0	0	0	0	0	38,098	0	0	0
Non-market output	118,445	0	0	0	0	0	0	0	112,185	0	0	0	6,260	0
Other non-market output	107,492	0	0	0	0	0	0	0	101,503	0	0	0	5,989	0
Payments for non-market output	10,953	0	0	0	0	0	0	0	10,682	0	0	0	271	0
Intermediate consumption	0	688,869	0	0	0	526,967	0	28,071	0	40,866	0	89,248	0	3,717
Value added, gross / Gross Domestic Product (GDP)		702,641				418,016		43,910		84,061		81,812		3,233
INCOME GENERATION ACCOUNT														
Compensation of employees	334,641	339,804	6,216	1,053	0	242,812	0	19,293	0	60,974	334,641	13,772	0	2,953
Wages and salaries	263,145	267,717	5,426	854	0	194,990	0	14,586	0	45,755	263,145	10,045	0	2,341
Employers' social contributions	71,496	72,087	790	199	0	47,822	0	4,707	0	15,219	71,496	3,727	0	612
Taxes on production and imports	81,791	84,876	3,085	0	0	4,703	0	1,691	81,791	652	0	2,711	0	28
Taxes on products	72,508	0	2,583	0	0	0	0	0	72,508	0	0	0	0	0
Value added tax (VAT)	48,557	0	0	0	0	0	0	0	48,557	0	0	0	0	0
Taxes on products		75,091	0	0	0	0	0	0	0	0	0	0	0	0
Other taxes on products	14,418	0	0	0	0	0	0	0	14,418	0	0	0	0	0
Taxes, duties on imports excluding VAT	9,533	0	2,583	0	0	0	0	0	9,533	0	0	0	0	0
Other taxes on production	9,283	9,785	502	0	0	4,703	0	1,691	9,283	652	0	2,711	0	28
Difference imputed and paid VAT	-172	0	0	0	-104	0	0	0	0	0	-68	0	0	0
Subsidies (-)	8,406	9,176	770	0	0	4,703	0	43	8,406	41	0	1,079	0	0
Subsidies on products	3,270	3,310	40	0	0	0	0	0	3,270	0	0	0	0	0
Other subsidies on production	5,136	5,866	730	0	0	4,703	0	43	5,136	41	0	1,079	0	0
Consumption of fixed capital, operating surplus		105,604				62,415		4,147		22,476		16,314		252
Consumption of fixed capital, mixed income		8,785										8,785		
Mixed Income net		51,266										51,266		
Operating surplus, net		121,482				112,685		18,822		0		-10,025		0

Note: This table presents the Integrated Economic Accounts (SNA) for the year 2016. For clarity, the accounts are displayed in three separate parts, but they should be read as a continuous whole. The rows represent the various economic transactions and balancing items, structured according to the System of National Accounts (SNA), while the columns correspond to the main institutional sectors of the economy, such as households, corporations, government, and the rest of the world. Values are in million euros.

Table 4.8: Account E, part 2

	S1 Total Economy (TOT)		S2 Rest of World (ROW)		S11 Non-Financial Corporations (NFC)		S12 Financial Corporations (FC)		S13 General Government (GOV)		S14 Households (HH)		S15 Non-Profit Instutions Serving Households (NPI)	
	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursemer
PRIMARY AND SECONDARY DISTRIBUTION OF INCOME ACCOUNT														
Property income	321,724	322,656	207,722	206,790	33,415	67,064	231,249	243,148	8,009	7,828	48,802	4,600	249	
Interest	90,933	87,010	64,418	68,341	8,745	9,212	78,427	65,549	2,030	7,811	1,539	4,422	192	
Distributed income of corporations	185,117	138,152	102,507	149,472	23,938	42,254	146,787	95,898	3,020	0	11,315	0	57	
Dividends	182,929	135,162	100,861	148,628	23,766	39,264	146,208	95,898	3,020	0	9,878	0	57	
Withdrawals from income of quasi-corps.	2,188	2,990	1,646	844	172	2,990	579	0	0	0	1,437	0	0	
Reinvested earnings on foreign investm.	-12,268	39,955	39,955	-12,268	590	12,825	-12,858	27,130	0	0	0	0	0	
Other investment income	54,974	54,571	842	1,245	138	0	18,893	54,571	8	0	35,935	0	0	
Inv. income attributable to shareholders	19,086	18,124	159	1,121	48	0	18,415	18,124	8	0	615	0	0	
Income payable on pension entitlements	30,946	31,528	582	0	0	0	0	31,528	0	0	30,946	0	0	
Investm. income attrib. to policy holder	4,942	4,919	101	124	90	0	478	4,919	0	0	4,374	0	0	
Rent	2,968	2,968	0	0	4	2,773	0	0	2,951	17	13	178	0	
Current taxes on income and wealth	81,998	80,071	2,383	4,310	0	16,503	0	5,455	81,998	2	0	58,111	0	
Current taxes on income	74,431	72,612	2,383	4,202	0	16,503	0	5,455	74,431	2	0	50,652	0	
Other current taxes	7,567	7,459	0	108	0	0	0	0	7,567	0	0	7,459	0	
Social contributions	177,064	174,645	284	2,703	7,162	0	62,059	0	107,364	0	454	174,645	25	
Employers' actual social contributions	61,335	61,086	0	249	0	0	24,757	0	36,578	0	0	61,086	0	
Employers' actual pension contributions	24,757	24,508	0	249	0	0	24,757	0	0	0	0	24,508	0	
Employers' actual non-pension contributions	36,578	36,578	0	0	0	0	0	0	36,578	0	0	36,578	0	
Employers' imputed social contributions	10,872	10,872	0	0	7,162	0	120	0	3,111	0	454	10,872	25	
Employers' imputed pension contributions	106	106	0	0	0	0	-444	0	550	0	0	106	0	
Employers' imputed non-pension contributions	10,766	10,766	0	0	7,162	0	564	0	2,561	0	454	10,766	25	
Households' actual social contributions	79,977	78,273	284	1,988	0	0	12,302	0	67,675	0	0	78,273	0	
Households' actual pension contributions	12,302	11,874	0	428	0	0	12,302	0	0	0	0	11,874	0	
Households' actual non-pension contributions	67,675	66,399	284	1,560	0	0	0	0	67,675	0	0	66,399	0	
Households' social contrib. supplements	31,528	30,946	0	582	0	0	31,528	0	0	0	0	30,946	0	
Households' pension contribution supplements	31,528	30,946	0	582	0	0	31,528	0	0	0	0	30,946	0	
Households' non-pension contribution supplements	0	0	0	0	0	0	0	0	0	0	0	0	0	
The social insur. scheme service charges	-6,648	-6,532	0	-116	0	0	-6,648	0	0	0	0	-6,532	0	
Social benefits other than social transfers in kind	125,633	128,153	2,760	240	0	7,162	0	41,311	0	79,201	125,633	454	0	
Social security benefits in cash	53,479	55,269	2,030	240	0	0	0	0	0	55,269	53,479	0	0	
Social security pension benefits (in cash)	0	0	0	0	0	0	0	0	0	0	0	0	0	
Social security non-pension benefits in cash	53,479	55,269	2,030	240	0	0	0	0	0	55,269	53,479	0	0	
Other social insurance benefits	51,333	52,063	730	0	0	7,162	0	41,311	0	3,111	51,333	454	0	
Other social insurance pension benefits	40,567	41,297	730	0	0	0	0	40,747	0	550	40,567	0	0	
Other social insurance non-pension benefits	10,766	10,766	0	0	0	7,162	0	564	0	2,561	10,766	454	0	
Social assistance benefits in cash	20,821	20,821	0	0	0	0	0	0	0	20,821	20,821	0	0	
Other current transfers	164,252	173,355	12,902	3,799	5,468	7,302	18,459	18,475	116,257	122,013	16,058	20,992	8,010	4,5
Net non-life insurance premiums	16,116	15,605	516	1,027	0	3,495	16,078	2,342	38	186	0	9,541	0	
Non-life insurance claims	15,301	15,853	1,148	596	3,542	0	2,033	15,803	186	50	9,499	0	41	
Current international co-operation	146	2,671	2,671	146	0	0	0	0	146	2,671	0	0	0	
Current transfers within gen. government	113,209	113,209	0	0	0	0	0	0	113,209	113,209	0	0	0	

Note: This table presents the Integrated Economic Accounts (SNA) for the year 2016. For clarity, the accounts are displayed in three separate parts, but they should be read as a continuous whole. The rows represent the various economic transactions and balancing items, structured according to the System of National Accounts (SNA), while the columns correspond to the main institutional sectors of the economy, such as households, corporations, government, and the rest of the world. Values are in million euros.

Table 4.9: Account E, part 3

	S1 Total Economy (TOT)		S2 Rest of World (ROW)		S11 Non-Financial Corporations (NFC)		S12 Financial Corporations (FC)		S13 General Government (GOV)		S14 Households (HH)		S15 Non-Profit Instutions Serving Households (NPI)	
	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements
Miscellaneous current transfers	19,480	23,794	6,344	2,030	1,926	3,807	348	330	2,678	3,674	6,559	11,451	7,969	4,532
The VAT- and GNI-based EU own resource	0	2,223	2,223	0	0	0	0	0	0	2,223	0	0	0	0
Primary Income, net (& National Income)		579,842				79,036		6,923		73,566		420,084		233
Disposable income, net		572,565				60,699		22,200		177,969		308,027		3,670
USE OF INCOME ACCOUNT														
Final consumption expenditure	0	484,374	0	0	0	0	0	0	0	173,682	0	304,703	0	5,989
Actual final consumption		484,374								57,821		426,553		
Social transfers in kind	121,850	121,850								115,861	121,850	0	0	5,989
Adjusted disposable income, net		572,565				60,699		22,200		62,108		429,877		-2,319
Adjusted disposable income, net, incl. Capital Transfers	-142,158	571,523		-16,729		61,227		22,334		60,198		429,365		-1,601
Adjustm. change in pension entitlements	20,335	20,748	413	0	0	0	0	20,748	0	0	20,335	0	0	0
Saving, net/Current external balance		87,778		-61,248		60,699		1,452		4,287		23,659		-2,319
CAPITAL ACCOUNT														
Consumption of fixed capital, total	0	114,389	0	0	0	62,415	0	4,147	0	22,476	0	25,099	0	252
Capital transfers	15,735	16,777	1,889	847	641	113	149	15	7,687	9,597	6,540	7,052	718	0
Capital taxes	1,845	1,855	141	131	0	0	0	0	1,845	0	0	1,855	0	0
Investment grants	6,132	5,831	59	360	475	0	0	0	5,486	5,831	64	0	107	0
Other capital transfers	7,758	9,091	1,689	356	166	113	149	15	356	3,766	6,476	5,197	611	0
Gross capital formation	0	140,919	0	0	0	73,191	0	2,988	0	24,603	0	39,861	0	276
Fixed capital formation, gross	0	140,049	0	0	0	72,400	0	2,988	0	24,498	0	39,905	0	258
Changes in inventories		870		0		791		0		105		-44		18
Acq. less disposals of valuables and non-prod. assets	0	596	0	-596	0	1,577	0	745	0	-2,323	0	593	0	4
Changes in net worth due to net saving plus capital transfers		86,736		-60,206		61,227		1,586		2,377		23,147		-1,601
Net lending		59,610		-59,610		48,874		2,000		2,573		7,792		-1,629

Note: This table presents the Integrated Economic Accounts (SNA) for the year 2016. For clarity, the accounts are displayed in three separate parts, but they should be read as a continuous whole. The rows represent the various economic transactions and balancing items, structured according to the System of National Accounts (SNA), while the columns correspond to the main institutional sectors of the economy, such as households, corporations, government, and the rest of the world. Values are in million euros.

Individual Final Consumption of HH's, GOV and NPI's in basic prices, by products (CPC) and functional categories (COICOP) and Age Groups (tables D)

Tables D1 and D2 below present a cross-classification of individual final consumption of HH's, NPI's and GOV between SNA-CPC product categories, COICOP[80] functional or purpose categories of HH final consumption, and by age groups. Table D1, part 1 presents a cross-classification of HH final, consumption by CPC product categories in the columns (1-18) and COICOP categories in the rows. Table D1, part 2 presents a cross-classification of GOV and NPI individual final consumption by CPC (columns 24-34) and COICOP categories in the rows. Both tables include in addition the same columns for classifications of total HH final consumption by COICOP categories without SUT adjustments (column 19), with partial SUT adjustments (column 21) and with full SUT adjustments (column 23) as well as two columns (20 and 22) with the totals partial SUT adjustments (27,835 and 496). The full SUT adjustments are included in columns 25-36 of table C, and the partial adjustments exclude consumption by residents abroad minus consumption by non-residents in the country.

All tables presented in in this section refer to *individual final consumption* paid for by HH's, GOV and NPI's. This is the same concept as used in the final consumption rows of the SUT appendix table C. The concept of individual final consumption, as defined in the SNA (SNA 2008) is the difference between two SNA concepts of *final consumption expenditure* and *actual final consumption*. Individual final consumption of GOV and NPI is deducted from final consumption expenditure of GOV and NPI's and added to final consumption expenditure of HH's, to arrive at actual final consumption of the three sectors. As all NPI final consumption expenditure is considered individual consumption, actual NPI final consumption is zero. The concept of actual final consumption is used in the macro sector accounts of HH's, GOV and

[80] COICOP is an SNA abbreviation for Classification Of Individual COnsumption by Purpose. The functional COICOP (Consumption of Individual Consumption by Purpose) holds in principle only for (individual) final consumption of expenditure HH's, while for GOV (COFOG) and NPI's (COPNI) other functional classifications used. However, COICOP is applied in tables D1 and D2 also to individual final consumption of GOV and NPI's. The latter application to individual final consumption of GOV and NPI goes further than what is recommended in the 2008 SNA (para. 29.13), which only allows for a distinction in COICOP between two categories of individual consumption of GOV and NPI's. Instead, we have used the correspondences between COICOP, COFOG and COPNI to allocate these two categories to individual COICOP categories, as such breakdown would improve the analysis of HH actual final consumption, which is a main concept of the present study.

NPI's of table E, in the micro HH sector accounts by age groups in table F and in the NTA table G by age groups.

The CPC-COICOP cross-classification of actual HH final consumption in table D1 is based on an assumed binary relation between CPC and COICOP categories for HH's. This assumed cross-classification is not very reliable, as the assumption of a binary or one-to-one correspondence for HH's between COICOP and CPC categories is only a rough approximation of the multiple correspondence that exist between the two classifications. The cross-classification for GOV and NPI's between COICOP and CPC categories is more reliable, as there is a close one-to-one correspondence between COICOP and CPC categories for these two sectors. Therefore, the HH cells of the CPC-COICOP cross-classification in table D1 are coloured yellow and the GOV and NPI cross-classifications are coloured green. The cells in the column 21 in tables D1 are coloured green, as the cells in this column are based on a number of data sources within the SUT (see Appendix B.5).

As the cross-classifications by COICOP and CPC categories of variables in table D1 are partly based on assumptions and partly on actual data available, the cross classifications of the prior values of variables by COICOP are not necessarily compatible with the prior values of the CPC totals in the last row of each column.

Table D2 includes a cross-classification for HH's, GOV and NPI's separately, between functional COICOP categories of final consumption in the rows and age groups used in the columns. The CPC and COICOP totals in this account are linked to those of account D1 and therefore also to the SUT. The breakdown by age groups is the same as used in the classification of micro HH data by age groups of account F (see below).

For HH's the total classified by COICOP in column (2) of account D2 is the same as the COICOP classification in column (23) of account D1. This COICOP breakdown includes all adjustments of the SUT and is furthermore based on the same CPC-COICOP as was used in account D1. The breakdown of these COICOP totals by age groups in columns (3) to (7) is based on % breakdown by ages, which is derived from the Household Budget Survey, as will be explained in the next section. All items of the cross-classification of HH final consumption by ages and COICOP in this account are derived items. They are based on assumptions, and therefore coloured yellow.

The totals of NPI and GOV final consumption data classified by COICOP on the right-hand side of the table in columns (8) and (14) are equal to the values in columns (27) and (34) in account D1. As these links are reliable, the figures are coloured green, and the value has a prior reliability. The breakdown of NPI and GOV final consumption by ages in columns (9)-(13) and (15)-(19) are derived by relying on assumptions, hence these figures are coloured yellow.

Table 4.10: Account D.1, part 1

COICOP	01-03 Products of agriculture, forestry and fishing	06-09 Petroleum, natural gas and other mining products, services	10-33 Manufacturing products	35 Electricity, gas, steam..	36-39 Natural water and waste treatment	41-43 Construction works	49-53 Transport, warehousing and postal services	55-56 Accomodations and food serving	58--63 Information and communication services	64-66 Financial services	68 Real estate services	69-75 Other specialized busines services	77-82 Renting and other busines support services	84 Public administration and services	85 Education services	86-87 Human health and social care services	90-93 Arts, culture, sports and recreation services
	HH	HH	HH	HH	HH	HH	HH	HH	HH	HH	HH	HH	HH	HH	HH	HH	HH
Food and non-alcoholic beverages	10,791	0	10,791	0	0	0	0	10,791	0	0	0	0	0	0	0	0	0
Alcoholic beverages, tobacco, narcotic	2,915	0	2,915	0	0	0	0	2,915	0	0	0	0	0	0	0	0	0
Clothing and footwear	0	0	14,063	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Housing, water, electricity, gas, fuel	0	0	0	16,228	0	16,228	0	0	0	0	16,228	0	16,228	0	0	0	0
Furnishings, equipment and maintenance	0	0	14,826	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Health	0	0	0	0	0	0	0	0	0	0	0	0	0	5,012	0	5,012	0
Transport	0	11,522	0	11,522	0	0	11,522	0	0	0	0	0	0	0	0	0	0
Communication	0	0	0	0	0	0	0	0	8,721	0	0	0	0	0	0	0	0
Recreation and culture	0	0	0	0	0	0	0	14,930	0	0	0	0	0	0	0	0	14,930
Education	0	0	0	0	0	0	0	0	0	0	0	0	0	1,078	1,078	0	0
Restaurants and hotels	0	0	0	0	0	0	0	22,630	0	0	0	0	0	0	0	0	0
Social protection	0	0	0	0	0	0	0	0	0	0	0	0	0	4,001	0	0	0
Other purposes	0	0	0	0	4,926	0	0	0	0	4,926	4,926	4,926	4,926	0	0	0	0
TOTAL CPC	6,603	4,352	94,112	4,613	2,753	435	6,932	23,009	12,324	16,526	56,173	2,771	11,708	1,431	3,415	12,040	7,857
TOTAL COICOP																	

Note: This table presents the Actual Individual Final Consumption by Households (HHs), Government (GOV), and Non-Profit Institutions serving Households (NPIs), disaggregated by product categories (CPC – Central Product Classification) and functional categories (COICOP – Classification of Individual Consumption by Purpose). Values are shown in basic prices, both with and without allocation adjustments. Values are in million euros.

Table 4.11: Account D.1, part 2

	94-96 Other services	Total of products, without adjustments COICOP provisional	Partial adjustments: Imputed VAT, Other goods and services n.e.c., sales of existing assets	Total of products, with partial adjustments COICOP	Adjustments for consumption by residents abroad and by non-residents in the country	Total of products, with all adjustments COICOP	84 Public administration and services	90-93 Arts, culture, sports and recreation services	94-96 Other services	Total	68 Real estate services	84 Public administration and services	85 Education services	86-87 Human health and social care services	90-93 Arts, culture, sports and recreation services	Other	TOTAL
COICOP	HH	HH		HH		HH	NPI's	NPI's	NPI's		GOV	GOV	GOV	GOV	GOV	GOV	GOV
Food and non-alcoholic beverages	0	32,372		35,624		35,682											
Alcoholic beverages, tobacco, narcotic	0	8,744		9,623		9,639											
Clothing and footwear	0	14,063		15,476		15,501											
Housing, water, electricity, gas, fuel	0	64,912		71,434		71,550					3,376						3,376
Furnishings, equipment and maintenance	0	14,826		16,316		16,343											
Health	0	10,025		11,032		11,050								48,798			48,798
Transport	0	34,567		38,040		38,102											
Communication	0	8,721		9,597		9,613											
Recreation and culture	0	29,861		32,861		32,914				2,453					4,490		3,617
Education	0	2,155		2,372		2,376							28,954				29,591
Restaurants and hotels	0	22,630		24,904		24,945											
Social protection	0	4,001		4,403		4,410				75		30,479					30,479
Other purposes	4,926	29,555		32,525		32,578				3,461							
TOTAL CPC	9,987	**277,041**	27,835	**304,876**	496	**305,372**											
TOTAL COICOP		276,433		**304,207**			75	2,453	3461		2,221	31,048	28,954	44,141	4,490		110,854

Note: This table presents the Actual Individual Final Consumption by Households (HHs), Government (GOV), and Non-Profit Institutions serving Households (NPIs), disaggregated by product categories (CPC – Central Product Classification) and functional categories (COICOP – Classification of Individual Consumption by Purpose). Values are shown in basic prices, both with and without allocation adjustments. Values are in million euros.

Table 4.12: Account D.2

COICOP	Total Individual consumption	HH final consumption by COICOP adjusted to level of total HH consumption	Age groups: 0-04 years	05-24 years	25-55 years	55-65 years	older than 65	NPI Individual Consumption by COICOP	Age groups: 0-04 years	05-24 years	25-55 years	55-65 years	older than 65	GOV Final Consumption	Age groups: 0-04 years	05-24 years	25-55 years	55-65 years	older than 65
			HH	HH	HH	HH	HH		NPI's	NPI's	NPI's	NPI's	NPI's		GOV	GOV	GOV	GOV	GOV
Food and non-alcoholic beverages	35,682	35,682	1,340	6,712	15,365	5,243	7,023		0	0	0	0	0	0	0	0	0	0	0
Alcoholic beverages, tobacco, narcotic	9,639	9,639	213	1,656	4,159	1,612	1,999		0	0	0	0	0	0	0	0	0	0	0
Clothing and footwear	15,501	15,501	675	3,129	6,934	2,217	2,547		0	0	0	0	0	0	0	0	0	0	0
Housing, water, electricity, gas, fuel	74,926	71,550	2,147	11,841	29,554	10,780	17,228	0	0	0	0	0	0	3,376	0	148	2,278	551	399
Furnishings, equipment and maintenance	16,343	16,343	608	2,889	6,910	2,540	3,395		0	0	0	0	0	0	0	0	0	0	0
Health	59,848	11,050	268	1,675	4,136	1,725	3,245	0	0	0	0	0	0	48,798	1,059	5,412	14,305	6,691	21,332
Transport	38,102	38,102	1,141	6,763	16,370	6,356	7,472		0	0	0	0	0	0	0	0	0	0	0
Communication	9,613	9,613	322	1,754	4,206	1,458	1,872		0	0	0	0	0	0	0	0	0	0	0
Recreation and culture	38,984	32,914	1,104	5,848	13,932	5,189	6,841	2,453	0	108	1,655	400	290	3,617	0	159	2,440	590	428
Education	31,967	2,376	119	629	1,144	279	205		0	0	0	0	0	29,591	915	26,352	2,256	68	0
Restaurants and hotels	24,945	24,945	710	4,197	10,922	4,223	4,892		0	0	0	0	0	0	0	0	0	0	0
Social protection	34,964	4,410	553	1,320	2,424	70	42	75	0	3	51	12	9	30,479	0	1,338	20,565	4,971	3,605
Other purposes	36,039	32,578	1,092	5,921	14,087	5,068	6,410	3,461	0	152	2,335	564	409	0	0	0	0	0	0
TOTAL COICOP	426,552	304,702	10,292	54,334	130,144	46,760	63,172	5,989	0	263	4,041	977	708	115,861	1,974	33,409	41,844	12,869	25,764

Note: This table presents a cross-classification of Actual Individual Final Consumption for Households (HHs), Government (GOV), and Non-Profit Institutions serving Households (NPIs). The rows reflect functional categories of consumption based on the COICOP classification, while the columns show population age groups. The breakdown allows analysis of consumption patterns by function and age, as well as institutional responsibility. All figures are expressed in basic prices. Totals by CPC and COICOP in this table are aligned with those reported in Account D1. Values are in million euros.

HH Micro Sector Accounts by Age Groups (tables F)

Table F presents a breakdown by age groups of the HH sector account in account E. As the HH sector in the IEA has the same variables, this applies also to the micro data of table F, which are a breakdown of the HH sector variables.

The age groups distinguished in this account are the ages 0-4, 5-24, 25-54, 55-64, 65+. The vertical structure of the HH micro accounts of table F is the same as the structure of the macro HH sector accounts in account E. Most HH transactions in account E also appear in account F. However, some are left out, either because the items are not important or cannot be broken down by age groups. E.g., “employers' imputed non-pension contributions” received by HH’s and “Other social insurance non-pension benefits” paid by HH are quantitatively unimportant and cancel each other out in the disposable income. Also, the transaction items of “adjustments to the change in pension entitlements” and “gross capital formation” are not assigned to age groups.

Because of these differences between macro and micro HH sector accounts, some balancing items are not reconciled between the two set HH sector accounts E and F: “saving, net”, “changes in net worth due to net saving plus capital transfers”, and “net lending”.

All variables in the table are coloured yellow and marked as non-available data, as the data are based on 2014 values, as no later data were available. The same underlying ratio values and identities (not presented in the table) as in the macro HH sector accounts are used in the Bayesian estimation, however. Important ratios, which are included in the macro HH sector as well in the micro HH sector accounts by age groups are the per capita and per worker ratios, such as HH actual final consumption per capita, labour income per worker, adjusted Disposable income, incl. capital transfers, net per capita, and GDP/capita.

Table 4.13: Account F, part 1

	S14 Households (HH)		0-4		5-24		25-54		55-64		65+	
	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements
PRODUCTION ACCOUNT												
Output, basic prices	171,060		0		2,253		119,005		32,927		16,876	
Market output	131,749		0		2,142		97,659		24,620		7,327	
Output produced for own final use	39,311		0		111		21,345		8,307		9,548	
Non-market output												
Intermediate consumption		89,248		0		1,451		66,155		16,678		4,963
Value added, gross / Gross Domestic Product (GDP)		81,812		0		802		52,849		16,249		11,912
INCOME GENERATION ACCOUNT												
Compensation of employees	334,641	13,772	0	0	13,925	224	258,270	10,209	60,182	2,574	2,265	766
Wages and salaries	263,145	10,045	0	0	11,029	163	202,279	7,446	47,572	1,877	2,265	559
Employers' social contributions	71,496	3,727	0	0	2,896	61	55,991	2,763	12,610	696	0	207
Other taxes on production		2,711		0		8		1,472		573		658
Other subsidies on production		1,079		0		18		800		202		60
Consumption of fixed capital, operating surplus		16,314		0		89		9,196		3,505		3,524
Consumption of fixed capital, mixed income		8,785		0		2,848		3,634		1,499		804
Mixed Income, net		32,530		0		529		24,113		6,079		1,809
Operating surplus, net		13,472		0		38		7,315		2,847		3,272
PRIMARY AND SECONDARY DISTRIBUTION OF INCOME ACCOUNT												
Interest	1,539	4,422	0	0	27	28	543	3,326	346	702	623	366
Dividends	9,878		0		35		4,929		2,543		2,372	
Withdrawals from income of quasi-corps.	1,437		0		5		717		370		345	
Other investment income	35,935	0	0	0	556	0	26,229	0	7,041	0	2,109	0
Inv. income attributable to shareholders	4,374		0		25		1,558		943		1,849	
Income payable on pension entitlements	30,946		0		528		24,453		5,965		0	
Investm. income attrib. to policy holder	615		0		4		219		133		260	
Rent	13	178	0	0	0	1	4	97	4	38	6	42
Current taxes on income		50,652		0		339		30,616		12,267		7,430
Other current taxes		7,459		0		50		4,509		1,806		1,094
Social contributions		174,645		0		6,554		124,799		33,311		9,980
Employers' actual pension contributions		24,508		0		415		19,384		4,709		0
Employers' actual non-pension contributions		36,578		0		1,934		28,496		6,149		0
Employers' imputed pension contributions		106		0		2		84		20		0
Employers' imputed non-pension contributions		10,766		0		569		8,387		1,810		0

Note: This table presents the Household Sector Accounts disaggregated by age groups, with values expressed in million euros. It includes a breakdown of key economic accounts such as the Production Account, Income Generation Account, and Primary and Secondary Distribution of Income Account. The structure and variables follow the Integrated Economic Accounts (Account E) and are linked to the age-specific analysis used in this study. The columns reflect the different population age groups, allowing for distributional insights across the life cycle.

Table 4.14: Account F, part 2

	S14 Households (HH)		0-4		5-24		25-54		55-64		65+	
	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursements	Receipts	Disbursemen
PRIMARY AND SECONDARY DISTRIBUTION OF INCOME ACCOUNT												
Households' actual pension contributions		11,874		0		206		9,362		2,306		
Households' actual non-pension contributions		66,399		0		3,012		39,795		13,612		9,9
Households' social contrib. supplements												
Households' pension contribution supplements		30,946		0		528		24,453		5,965		
Households' non-pension contribution supplements												
The social insur. scheme service charges		-6,532		0		-111		-5,161		-1,259		
Social benefits other than social transfers in kind	125,633		2		5,028		36,549		23,482		60,572	
Social security pension benefits (in cash)												
Social security non-pension benefits in cash	53,479		0		242		12,327		9,204		31,707	
Other social insurance pension benefits	40,567		2		127		2,611		10,212		27,616	
Other social insurance non-pension benefits	10,766		0		569		8,387		1,810		0	
Social assistance benefits in cash	20,821		0		4,090		13,224		2,257		1,250	
Other current transfers												
Net non-life insurance premiums		9,541		0		20		6,996		2,055		4
Non-life insurance claims	9,499		0		30		611		2,391		6,466	
Miscellaneous current transfers	6,559	11,451	0	0	3	1	4,136	6,388	1,687	3,358	733	1,7
Primary Income, net (& National Income)		424,845		0		15,085		318,697		78,672		12,3
Disposable income, net		312,788		3		13,182		186,684		53,434		59,4
USE OF INCOME ACCOUNT		426,552		12,267		88,005		176,029		60,606		89,6
Actual final consumption, HH		304,702		10,292		54,334		130,144		46,760		63,1
Actual final consumption, GOV		115,861		1,974		33,409		41,844		12,869		25,7
Actual final consumption, NPI		5,989		0		263		4,041		977		7
Social transfers in kind	102,470		2,265		32,100		26,743		10,455		30,907	
Adjusted disposable income, net		415,258		2,268		45,281		213,427		63,889		90,3
Adjusted disposable income, net, incl. Capital Transfers		414,746		2,268		45,434		214,412		64,050		88,5
Adjustm. change in pension entitlements												
Saving, net		-11,294		-9,998		-42,724		37,398		3,283		7
CAPITAL ACCOUNT												
Capital transfers												
Capital taxes		1,855		0		64		1,154		637		
Investment grants	64		0		0		35		14		16	
Other capital transfers	6,476	5,197	0	0	223	7	4,030	1,926	2,222	1,439	0	1,8
Changes in net worth due to net saving plus capital transfers	-11,806		-9,998		-42,571		38,382		3,443		-1,063	

Note: This table presents the Household Sector Accounts disaggregated by age groups, with values expressed in million euros. It includes a breakdown of key economic accounts such as the Production Account, Income Generation Account, and Primary and Secondary Distribution of Income Account. The structure and variables follow the Integrated Economic Accounts (Account E) and are linked to the age-specific analysis used in this study. The columns reflect the different population age groups, allowing for distributional insights across the life cycle.

An important addition the identities for all transactions between the totals of micro data by age groups and the macro variables of the HH sector By including identities with the 2014 values of micro variable and 2016 values of the macro variables of table E and also with related variables in tables A, B, C, D1, D2, E, the micro data will be adjusted in the Bayesian estimation to arrive at posterior micro estimates, that they are in line with the 2016 green values of all variables in the framework, and also with the 2016 values of ratios of the macro and micro HH sector variables in tables E and F.

The data for 2014 were the most recent micro data available. The corresponding 2010 values were fully consistent with our 2010 framework. The totals for all age groups together are presented in the HH sector column on the left-hand side of table F. For the reasons mentioned, they are not compatible with the macro HH sector accounts data in account E. Thus, for 2016 both the macro HH sector accounts and micro data are coloured yellow.

National Transfer Accounts (NTA, tables G)

Table G summarizes the data of the macro HH sector accounts and micro HH sector data by age groups, using an alternative analysis based on the concepts of the National Transfer Accounts. Included are “labour income” and “actual (individual) final consumption” and the difference between the two, defined as the “Lifecycle Surplus (+) Deficit (-)”. Furthermore, a “transfer surplus (+) / deficit (-)” is defined as the difference between “social benefits, other than social transfers in kind” and “social transfers in kind” and “other current transfers net” received, and “Taxes” paid, and “social contributions” paid. And finally, “net asset-based revenues, incl. capital transfers” is defined as the sum of “operating surplus”, “property income, net” received, and “capital transfers, net” received. All NTA item values of account G are directly derived from the SNA items of accounts E and F.

Table 4.15: Account G – National Transfer Accounts

	Total S14	Age groups				
		0-4	5-24	25-54	55-64	65+
Labour income	367,171	0	14,454	282,382	66,261	4,074
Actual (Individual) final consumption	426,552	12,266	88,005	176,029	60,606	89,644
Life Cycle Surplus (+) Deficit (-)	**-59,381**	**-12,266**	**-73,552**	**106,353**	**5,655**	**-85,571**
Taxes	-58,111	0	-389	-35,125	-14,074	-8,524
Social contributions	-174,645	0	-6,554	-124,799	-33,311	-9,980
Social benefits, other than social transfers in kind	125,633	2	5,028	36,549	23,482	60,572
Social transfers in kind	102,470	2,265	32,100	26,743	10,455	30,907
Other current transfers net	-4,934	0	12	-8,637	-1,335	5,025
Transfer surplus (+) / deficit (-)	**-9,587**	**2,268**	**30,197**	**-105,270**	**-14,783**	**78,001**
Operating surpolus	13,472	0	38	7,315	2,847	3,272
Property income, net	44,202	0	593	28,999	9,564	5,045
Capital Transfers, net	-512	0	153	985	161	-1,810
Net Asset Based Revenues, incl. Capital transfers	**57,162**	**0**	**784**	**37,299**	**12,572**	**6,507**
Saving net, including capital transfers	**-11,806**	**-9,998**	**-42,571**	**38,382**	**3,443**	**-1,063**

Note: This table presents the National Transfer Accounts (NTA), organized according to a sequence of economic accounts shown in the rows. Each row represents a specific transaction category or balancing item within the NTA framework. The columns display data segmented by age groups, reflecting the demographic breakdown used in the analysis. All monetary values are expressed in millions of euros. The table captures the intergenerational allocation of resources, detailing the flow of income, consumption, transfers, and saving across different age groups.

All items in the account are broken down by age groups. As all items are derived from the details of the Macro and Micro HH sector accounts by age groups of account F, the variables are all coloured yellow. Van Tongeren (UN, 2013, Appendix C, p.167-187) shows how the macro totals in this framework can be derived from the SNA.

Most cells in the macro HH sector accounts of account E and all cells in the micro HH sector data by age groups in accounts F and G of the framework are coloured yellow. The data of those cells are only considered to a limited extent in the Bayesian estimation: HH Adjusted Disposable Income including Capital Transfers is treated as an exogenous variable coloured green, which reflects our assumption that the overall HH wellbeing in all frameworks remains stable. Furthermore, identities and ratios between HH sector variables are imposed as restrictions on the posterior estimates of the HH sector.

4.7. Appendix B Reliability of Prior and Posterior Estimates, Data Sources, Model, and Test of Framework

The present appendix provides more detail on the topics other than frameworks, dealt with in Section 4.2 on Materials and Methods. It starts with information on the Bayesian estimation methodology in frameworks (appendix Section B.1) and thus adds to what presented in an earlier document by one of the authors (Van Tongeren, Picavet 2016). This section also deals with alternative reliability measures. It then discusses (appendix Section B.2) how estimated projections to 2025 are made with help of the Bayesian estimation methodology in frameworks, and the framework model (appendix Section B.3) that underlies the projections and also the integration of data in the compilation. In appendix Section B.4 it describes the tests that were made to show how posterior reliabilities in the LIMITED, EXTENDED and 2025 Projection frameworks are influenced by incorporating micro data, population and employment data by age groups, and also to assess the effect of different configurations of exogenous variables. And finally, in appendix Section (B.5), it evaluates the prior reliability of data sources.

4.7.1. B.1 The Bayesian Estimation Methodology

Bayesian Estimates and Frameworks

The methodology of Bayesian estimates was described in detail by Magnus, Van Tongeren and Vos (2000) and Magnus and Danilov (2008), and in simplified format by Van Tongeren and Picavet (2016). The essence of the approach is that the Bayesian estimation method minimizes the following weighted least square expression:

$$\sum_j \frac{1}{\sigma_j^2} * (X_j - \bar{X}_j)^2$$

In this expression the X_j stands for the posteriors of variables and ratios to be estimated, and $\bar{X}_j$ represents the priors, and the symbol σ_j stands for the prior standard deviation (SD). Thus $\frac{1}{\sigma_j^2}$ is the weight of the difference between X posterior and X prior. Instead of using the standard deviation σ, use is made of the variation coefficient VARC, which is defined as the prior or posterior standard deviation divided by the prior or posterior value, i.e., $VARC = \sigma/X$. The minimization is done under the conditions of a set of identities A*X, in which X is the vector of posterior variables X_j and A is the matrix of coefficients (0, 1 or – 1) of each variable in the identities.

Ratios are approximated by linearization of the nominator and denominator of the ratio, using realistic values of the nominator, so that they can also be included as conditional identities of the expression that should be minimized. As ratios are linearized not only between green cells, but also between yellow cells, the yellow cells should have data to achieve this linearization. These data could be approximate data, data of another year or data that are derived from data in green cells.

The Bayesian estimation methodology derives, based on prior data and VARCs' of variables and ratios and restrictions imposed by identities and ratios between variables, the posterior estimates of variables and ratios and their posterior VARC's. The basic information to derive all this are the prior VARC's that are determined subjectively by national accountants, given their knowledge of the basic data sources. These prior VARC's are determined for prior values of all variables and ratios. In terms of statistical theory, the prior VARC is the relative change that must not be exceeded in 68% of the cases.

The prior percent VARC is defined in the normal distribution as the quotient $= \frac{1\ prior\ SD}{prior\ value}$. This means, for instance, that if a prior VARC of 5% is assigned to a prior value 50, that 1 prior SD (standard deviation) is equal to 2.5 (=0.05*50). As this value is defined in a normal distribution, it implies that the prior value of 50 may vary in the posterior estimates between 47.5 (=50-2.5) and 52.5 (=50+2.5) for 1SD in 68% of the cases.

Another important aspect of the Bayesian estimation methodology used here is that all data, ratios, identities, and also prior reliabilities are incorporated in frameworks such as national economic and satellite accounts. The design of frameworks is an essential element of the methodology used here. In the present document three types of frameworks were used, i.e., LIMITED 2016 SNA Compilation framework, the EXTENDED 2016 NTA Compilation framework and the EXTENDED 2025 Projection framework. The structure of the framework is defined with help of ratios and identities that establish relations between variables. A distinction may be made between vertical and horizontal ratios and identities. The horizontal ratios define distribution of variables between sectors in the IEA, industries in the Production Accounts and products in the SUT. Vertical ratios define, as what could called, "behavioural" relations between for instance output, intermediate consumption and value added components for each industry in the Production accounts, or the breakdown of Disposable income in the sector accounts of the IEA and micro accounts of age groups. Horizontal identities generally define totals for the economy as whole of components by sectors, industries, and products. Vertical identities define for instance the relations between aggregate concepts of GDP, Disposable income, saving and components of industries, products and sectors and age groups.

It is the art of designing frameworks that include all these elements, as was described in Van Tongeren (2004), and which are the basis for applying the Bayesian estimation approach.

Posterior Estimates versus Prior Data on Variables and Ratios

The present document uses a very detailed set of source *data* and *estimates* that are based on those data. The source data, used as priors, are described below in appendix Section B.5, and posterior projected estimates were used in the analysis of Section 4.3. The mutual restrictions of data, identities, ratio values and reliabilities are the conditions that limit the posterior reliabilities of variables and ratios. It will be shown below that posterior estimates of variables and ratios are generally more reliable than their prior equivalents. Corresponding to this, prior variation coefficients (VARC's, i.e., prior standard deviations divided by prior values) are generally higher in value than the posterior ones for variables and ratios. This improvement of reliability is generally accepted by national accountants who use the traditional national accounts compilation methodology. However, through the Bayesian estimation approach we can quantify this increase in reliability.

The essence of the methodology used in this document is that Frameworks are used to incorporate data on many variables and ratios (Van Tongeren, 2011). Furthermore, identities are defined between the variables, as a measure of internal consistency of the framework. And finally, prior reliabilities are established for all data on variables and ratios, subject to the standard deviations (SD) of a normal distribution. These ingredients are used in the Bayesian estimation approach to arrive at posterior values of estimates of variables and ratios, under the conditions of the data, ratios and identities defined between the variables, and prior reliabilities.

Measures to assess the Posterior Reliability of Estimates

When determining the posterior reliability of estimates, also in projections, we have used two measures. The first one is the posterior VARC of the estimates, that is defined as the quotient[81] of the posterior standard deviation and the posterior value. The latter is generally lower in value than the prior VARC, due to the restrictions mentioned above, imposed on the posterior estimates. Thus, posterior values of estimates are generally more *precise* than the prior ones. This greater posterior precision does not only refer to the estimates for the past year of 2016, but also to the projections of 2025, which are also subject the large number of ratio and identity checks.

The VARC measure of precision, however, is not the only basis for reliability. Another measure is needed as the posterior estimates are more precise than the prior data, but at the same time posterior estimates may differ much or little from the prior values of data. Therefore, we have introduced a second measure, which quantifies the difference between the posterior and prior value relative to the prior value. This measure, which is called here the DIF, is like the prior VARC. The prior VARC is the quotient of SD_{prior}/X_{prior}, and the DIF is the quotient of $(X_{post}-X_{prior})/X_{prior}$. Both are divided by the X_{prior} and are thus comparable.

Thus, if the value of the DIF is smaller than the prior VARC, the posterior estimate is located within the range of 1 Standard Deviation (SD). In that case the posterior VARC and DIF indicate that the estimate is reliable according to the two measures. If, however, the value of DIF is much larger than the prior VARC, the estimate may be more precise, but differs at the same time much from the prior value. In this case the combination of the two measures indicates that the posterior estimates are less reliable due to the finding of the DIF measure. The reason that in some instances the DIF's in the LIMITED 2016 framework are larger than the prior VARC for individual transactions, may be because of inconsistencies between the prior VARC used in the Bayesian estimation approach and the implicit VARC in the traditional estimation approach used by Statistics Netherlands and other national accountants.

[81] We use here the term "quotient" defining the relation between posteriors and priors, and distinguish it from the term "ratio", which is defined between variables of the framework, and which is used in the Bayesian estimation.

In addition to the VARC and DIF we have used a third measure of reliability, and this is the *information factor*. It is defined as the ratio between the number of Variables to be estimated and the number of information items that is available to make the estimates. The information items include the data, ratio values, and identities. It was found that for the 2016 EXTENDED framework as whole, there were 1,774 variables to be estimated and the number of information items was 3,721. This resulted in an information factor for the whole framework of 2.10 (=3,721/1774), which means that there are more than two times as many information items than there are variables to be estimated. In mathematical terms it would not be possible accommodate more information items than variables to be estimated. However, as all data and ratio values have prior reliabilities, prior values could be changed, to satisfy all restrictions of identities. Thus, it is possible to use the information items as checks on each other.

The higher the number of information, the more precise the estimates will be. Thus, in the 2016 LIMITED SNA framework, the number of information items is 2,266, the number of variables is 1,039, and thus the information factor is 2.18 (=2,266/1,039), slightly higher than that in 2016 EXTENDED framework. In the 2025 PROJECTION framework only a very limited number of data is available, which are the projected data in the four scenarios; the number of variables, ratios and identities are virtually the same as in the 2016 framework. Thus, in the 2025 PROJECTION framework, there are 1,774 variables and the number of information items is 2,858. The information factor is then 1.61 (=2,858/1.774), which is much lower than in the 2016 LIMITED and EXTENDED frameworks.

4.7.2. B.2 How are Projections made to 2025?

Identity and ratio relations between variables in the 2016 framework are used as mutual checks to derive the values of the endogenous variables and ratios from the fixed values (reliability F) of the exogenous variables in the 2025 projection framework.

The relations incorporated in all frameworks, and thus also in the 2025 projection frameworks can be described as follows: The SUT ratios define among others the relation between the exogenous variable of exports and output and thus can be used to estimate the 2025 values of the macro endogenous variables of output, gross fixed capital formation and imports and HH final consumption. The labour share defines the relation between the exogenous variables of GDP and value added and thus can be used to derive the components of Labour Income.

The vertical distribution coefficients of HH Disposable Income by revenues and outlays, define the relation between the exogenous variable of HH Disposable Income and thus can be used to derive the values of the endogenous variables of HH final consumption, labour income, and taxes. The coefficients of distribution of HH Disposable Income by age groups, can be used to derive the values of the micro parallel endogenous concepts by age groups. Through the vertical distribution coefficients of HH disposable income by age groups, these ratios can be used to derive the values of final consumption, labour income, and taxes by age groups. The input coefficients of output can be used to derive the values of the endogenous variables of intermediate consumption, value added, and value added components by industries or ISIC categories. Per capita values of GDP, HH social transfers paid and received, and HH final consumption define the link between the exogenous variable of population by age groups on the one hand and micro distribution of HH variables by age groups. And finally, average per worker values of output and compensation of employees define the link between the exogenous variable of employment by age groups, with the endogenous variables of labour income, output and the micro distribution of revenue and outlay components by age groups.

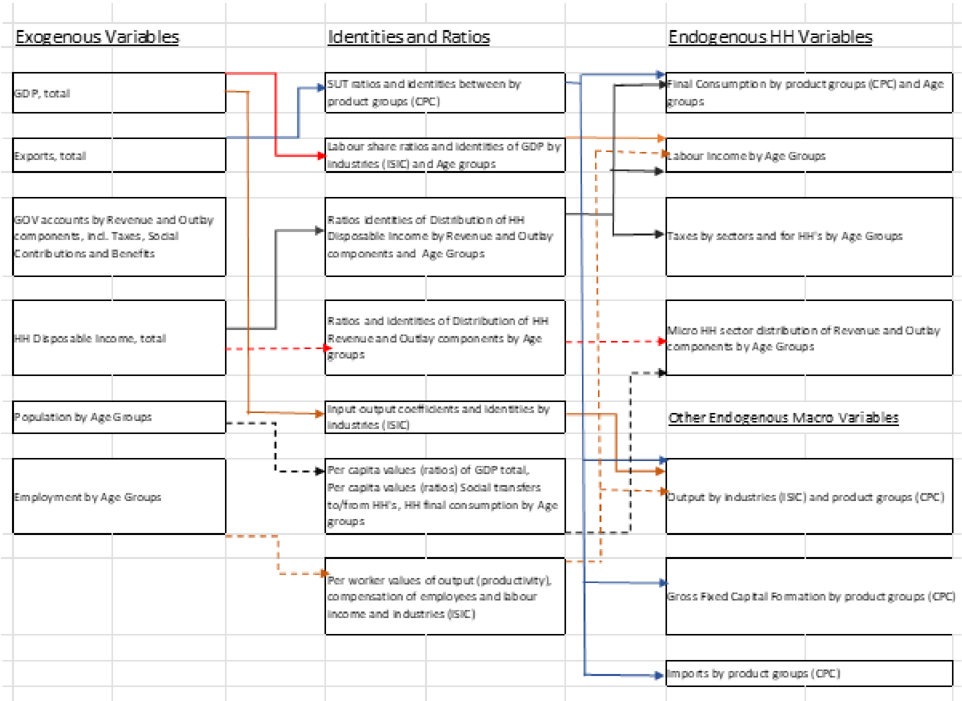
From this description it can be seen how through ratios and identities the same endogenous variable is linked multiple times with exogenous variables, and thus serve as checks. Thus, HH final consumption is linked with the exogenous variable of GDP through the SUT ratios and the exogenous variable of HH Disposable Income through the ratios governing the (vertical) distribution of HH revenue and outlay components. Similarly, the endogenous micro variables are linked to the exogenous variable HH Disposable Income through the vertical distribution of HH revenue and outlay components, and to the exogenous variable of employment by age groups through the ratio of compensation of employees and labour income per worker. Any conflicts between these multiple relations are corrected through adjustments of the prior values of variables and ratios permitted by prior reliabilities of those in the Bayesian estimation approach. The same adjustments are made to the prior values of variables and ratios of the macro and micro HH sector by age groups and transaction components, to arrive at posterior values.

The posterior projected estimates for 2025 have posterior reliabilities were derived with help of the Bayesian estimation approach from prior 2016 reliabilities and identities. This was described in Section 4.2.6.

4.7.3. B.3 The Model underlying the Compilation and Projection of the Framework Data

In the diagram below are represented the most important analytical relations between the variables as reflected in ratios and identities. The exogenous variables are presented on the left-hand side of the table, the endogenous variables on the right-hand side and the ratios and identities in the middle of the table. The exogenous variables were already identified in the Introduction to this document (Section 4.1). They include mainly totals, except for population and employment by age groups. The endogenous variables on the right-hand side show much more detail, with classifications by age groups, industries (ISIC) and sectors and products (CPC). The industries and products are aligned with each other. The conversion of exogenous totals to endogenous detail is made by ratios and identities that are estimated, respectively hold, in each framework.

Figure 4.7: Schemtic representation of variables and ratios in frameworks



The ratio values may differ between the years, but the identities invariably hold for all frameworks. This could be considered as the model behind the framework. This model is used for all frameworks dealt with in this document for the compilation or integration of macro-economic data and micro HH sector data by age groups, and also for the projection of estimates to 2025.

In the EXTENDED 2016 framework, they are used in the *compilation* as checks that are available on the values of data and ratios. If values of endogenous variables and ratios have different prior values, when using the values of macro-economic data and corresponding ratios of the SNA or using the micro HH sector data and ratios, the prior values of data and ratios will be changed in the Bayesian estimation approach, and posterior values of estimates result that satisfy all identity and ratio relations between macro and micro variables.

In the *projection* framework of 2025, dealt with in the previous appendix Section (B.2), the identities and ratios are the relations between variables that make it possible to estimate the values of all variables and ratios based on very few exogenous variables. As was shown in the diagram above, the information factor of the projection framework was still larger than 1 (1.61), so that ratios and identities cannot only be used to derive the posterior values of estimates of endogenous variables Band ratios, but also, as in the compilation of posterior 2016 values, as checks.

The description below focuses on the derivation of posterior values in the *projection* of 2025 posterior values, but equally hold in the *compilation* of posterior values of estimates for 2016. The values of the exogenous variables have assumed values under the four scenarios of Section 4.2.7. They are treated as variables with fixed values (reliability F), which do not change between prior and posterior values. All variables, except the exogenous ones, are endogenous. They include in particular the macro-SNA HH variables and NTA micro variables by age groups. And furthermore, are included as endogenous all variables of the Production accounts (Account A of Section 4.6), SUT (account C), Final consumption (accounts D1 and D2), as well as non-HH sector accounts of the IEA (account E).

The prior values of the endogenous variables and the ratios for the 2025 projections are those of 2016. With help of the Bayesian estimation approach adjusted posterior values for 2025 are derived that satisfy all consistency requirements, i.e., all identities and ratios, of the 2025 projection framework. The diagram includes only a small selection of the most important exogenous, endogenous variables, ratios and identities that are used in the derivation of posterior estimates.

As was mentioned above, and reflected in the diagram above, the 2025 projection framework includes 107 exogenous variables, 1667 (=1774-107) endogenous variables, 1777 ratios and

974 (independent)[82] identities. Even though the diagram only presents a limited number of endogenous variables, ratios, and identities, the diagram represents well how in the projection framework the values of endogenous variables can be derived from the exogenous ones.

Thus, the SUT ratios define the relation between the exogenous variable of exports and thus can be used to derive the values of the endogenous variables of HH final consumption, the macro endogenous variables of output, gross fixed capital formation and imports. The labour share defines the relation between the exogenous variables of GDP and value added and thus can be used to derive the components of Labour Income. The vertical distribution coefficients of HH Disposable Income by revenues and outlays, define the relation between the exogenous variable of HH Disposable Income and thus can be used to derive the values of the endogenous variables of HH final consumption, labour income, and taxes. The coefficients of distribution of HH Disposable Income by age groups, can be used to derive the values of the micro parallel endogenous concepts by age groups. Through the vertical distribution coefficients of HH disposable income by age groups, these ratios can be used to derive the values of final consumption, labour income, and taxes by age groups. The input coefficients of output can be used to derive the values of the endogenous variables of intermediate consumption, value added, and value added components by industries or ISIC categories. Per capita values of GDP, HH social transfers paid and received, and HH final consumption define the link between the exogenous variable of population by age groups on the one hand and micro distribution of HH variables by age groups on the other. And finally, average per worker values of output and compensation of employees define the link between the exogenous variable of employment by age groups, with the endogenous variables of labour income, output and the micro distribution of revenue and outlay components by age groups.

Already in this scheme of a limited number of endogenous variables and ratios, it can be seen how the same endogenous variable is linked multiple times through ratios and identities with exogenous variables, and thus serve as checks. Thus, HH final consumption is linked with the exogenous variable of GDP through the SUT ratios and the exogenous variable of HH Disposable Income through the ratios governing the (vertical) distribution of HH revenue and

[82] Not all identities are counted, as some can be derived from other identities and are therefore independent.

outlay components. Similarly, the endogenous micro variables are linked to the exogenous variable HH Disposable Income through the vertical distribution of HH revenue and outlay components, and to the exogenous variable of employment by age groups through the ratio of compensation of employees and labour income per worker. Any conflicts between these multiple relations are corrected through the Bayesian estimation approach, which also consider identities within the HH sector by age groups and in total, and between macro variables.

4.7.4. B.4 Tests to assess the Reliability of Bayesian Estimates in the Compilation and Projection Frameworks

Three tests were carried out with help of Bayesian estimation approach, to assess the reliability of the Bayesian estimation approach. The first one was applied to the LIMITED framework as annually compiled by Statistics Netherlands, the second one to the EXTENDED framework in which micro data were incorporated, and the third to the projection framework that was used to project data to 2025. Based on these tests and the technical details of the Bayesian estimation method described above, some conclusions are drawn regarding resulting posterior estimates of the Bayesian methodology used.

Test 1 of LIMITED Economic Framework

Test 1 was applied to data of the LIMITED economic framework that were already reconciled by national accountants of Statistics Netherlands. The purpose of this test was to determine whether the Bayesian estimation approach would be a reliable alternative to the traditional compilation approach. Two observations were made.

Firstly, it was found that the posterior VARC was much smaller than the prior VARC (on the average for the whole framework, the prior VARC was 1.99% and the posterior VARC 0.12%), and thus posterior estimates based on this methodology were much more precise than the prior ones, due to the many restrictions of data, identities, ratios and prior VARC's that are imposed on posterior estimates. Secondly, it was observed that the DIF between posterior and prior values relative to the prior values (0.10%) was also much smaller than the prior VARC (1.99%) and thus, the posterior estimates were within the corresponding 1 SD (Standard Deviation) range of the prior values. Both observations support the conclusion that the Bayesian estimation method is an acceptable alternative to the traditional compilation approach. An advantage of this approach is furthermore that the posterior measures of reliability –Posterior VARC and DIF—are quantifiable, which is not the case in the traditional method.

The observations regarding the averages for the framework as a whole, holds also for segments of the framework and for majority of estimates of individual variables and ratios. For most variables and ratios, the DIF is also smaller than the prior VARC. Only in a few cases (1.36%) of individual variables, the DIF is larger than the prior VARC in the first test. For those transactions the number of restrictions used in the Bayesian compilation method may be much larger than those used in the traditional compilation, and this may explain the larger change of posterior value as compared to prior value estimated by national accountants of Statistics Netherlands. In this case, one might argue that the Bayesian estimates with different posterior values are more precise than those based on the traditional compilation method, because more restrictions are imposed.

Test 2 of EXTENDED NTA Framework

In test 2, micro data by age groups on employment, population and HH sector accounts, were added as basic data, resulting in an EXTENDED NTA framework. These additional basic data were not used by national accountants in their compilation. The purpose of this test was to determine the extent to which posterior VARC and DIF were affected.

As in test 1, test 2 shows that the precision of posterior estimates of variables and ratios is much higher than the subjective precision of the prior estimates (the posterior VARC of 0.19% is much lower than the prior VARC of 2.18%), even though data on micro variables and ratios were added to the EXTENDED NTA framework. Also, the posterior VARC was not significantly higher than in the LIMITED Economic framework, in which the micro data were not included (0.19% in the EXTENDED framework and 0.12% in the LIMITED framework). On the other hand, this test shows that the DIF (6.21%) was much larger than the prior VARC (2.18%). This means that the DIF is outside 1 SD range of the prior data. This larger DIF was to be expected due the use of the additional micro data in the Bayesian estimation. These findings of test 2 are relevant, as the EXTENDED framework is used for the projections to 2025.These results also apply to most segments of the framework and to individual transactions of the SNA HH sector. What was also noted in the detailed analysis of the test 2 results, was that the posterior VARC was higher for the NTA micro accounts by age groups (0.07%) than for the

SNA macro HH sector accounts (0.04%) in this test. Thus, posterior NTA estimates of the NTA HH sector accounts by age groups in the EXTENDED framework, based on the Bayesian estimation method, are a bit less precise than the SNA estimates of HH sector accounts. The DIF for the NTA micro HH accounts by age groups (15.64%) was much higher than the DIF for the SNA macro HH accounts (6.75%). In both cases these values *seem to be outside the prior 1 SD range*, although in practice we do not know this, as there are no prior VARC's for these accounts. The latter conclusions are relevant for the analysis in Section 4,3, which is largely based on the detailed NTA accounts by age groups.

Finally, it is also observed that the DIF was very low (much less or close to 3%) for important analytical SNA HH sector ratio indicators, such as Final consumption expenditure as % of GDP, Actual Final HH Consumption as % HH Adj. Disposable Income incl. Capital Transfers, Compensation of employees/nr. of employees (average income per employee), Labour income per worker (average income per worker), HH actual final consumption per capita, Adjusted Disposable income, incl. capital transfers, net per capita, Nr. of workers as % of population, and GDP per capita. An exception to this were ratios of Social transfers net per capita and Property income net per capita which had a DIF of 23.23% and 47.29% respectively. Thus, in general DIF's of ratios were lower than DIF's of the underlying variables, and thus are more stable between priors and posteriors. This did not apply to the micro NTA HH sector ratios such as Labour income/actual final consumption, Transfer balance/actual final consumption, Net Asset Based Revenues/actual final consumption, and Saving/actual final consumption. They had very high DIF values (respectively 3.60%, 193.60%, 56.06% and 497.44%), because they were mainly based on balancing items, which are generally more difficult to estimate.

Test 3 of Projection Framework

Test 3 assesses the reliability of the projections to 2025. The assessment is done by simulating the projections data of variables and ratios from a past period 2010 to a later past period of 2016. From these projections based on past periods, some conclusions could be drawn, which might be relevant for the projections to 2025. It was found that the posterior VARC (0.23%), based on the 2016-2010 framework with data only on exogenous variables for 2016, was only a bit higher than the posterior VARC (0.19%) based on a full 2016 framework (as used in test 2). Thus, posterior estimates of the 2016-2010 framework were not significantly less precise than those based the full 2016 framework. The DIF used in this test differs from the one used in tests 1 and 2. It was defined as the difference between posteriors of a 2016-2010 framework with only 2016 values for exogenous variables, and posteriors of a full 2016 framework, divided by the posteriors of a full 2016 framework. As in test 2, the value of this DIF (9.60%) is much higher than the posterior VARC (0.19%) of the full 2016 framework, and thus far outside the 1 SD range of the posteriors of the full 2016 framework. What should be noted, however, is that this DIF of the projected estimates is not significantly higher than the DIF in test 2 (6.21%) in which posterior estimates were compiled and not projected. The two DIF's, however, are not fully comparable, as they are differently defined. Thus, the posterior VARC and DIF of projected estimates of the 2016-2010 framework are not significantly different from those based on compiled estimates of 2016 framework. These conclusions about 2016 projections based on the 2016-2010 framework as compared with compilation of the 2016 framework should be considered when assessing the 2025 projections analysed in Section 4.3. The 2025 projections are only based projected data of exogenous variables to 2025 the remaining variables and all ratios based on 2016 data. The restrictions of ratio values together with the identities, however, keep the 2025 projections within acceptable bounds.

4.7.5. B.5 Data Sources and their Prior Reliability

The quality, or prior reliabilities, of the underlying data sources of the SNA accounts are important for us when determining for 2016 the posterior reliabilities of all estimates of all variables and ratios in the extended framework, The latter include both SNA variables as well variables of micro data.

When estimating the values of variables of the 2025 extended projection framework only values of exogenous variables are used; they are given the highest possible reliability (Fixed). With help of the values of exogenous variables, identities, 2016 prior ratio values and 2016 prior reliabilities are used to derive the posterior estimated values of all variables and ratios and also the posterior reliabilities of values of variables and ratios.

Each segment in the framework uses specific data sources, described in detail in the GNI inventory (CBS, 2017), that belongs to the compilation of the national accounts. Through integration of data in the SNA, the system is made fully consistent. The GNI inventory describes the data sources used per SNA transaction and classifies these by type of data source. These types are either surveys and censuses, administrative records, combined data, or models. Administrative data are often more exhaustive than surveys. Combined data includes many data sources, ranging from industry reports, supervisory data, or annual reports to internet surveys and expert guesses. Additional data validation, and adjustments are needed to arrive at SNA estimates. These are needed because data sources are never designed with the purpose of creating national accounts, or because there simply is no data source to be found. For our purpose, the perceived quality of the data sources is important to allocate reliabilities to the prior data. Those parts of the framework where data quality is considered relatively low, posteriors are allowed to deviate more from the prior data than in the parts with high quality data.

The primary data source for the production accounts is the Business Statistics covering the production of enterprises. These are complemented with other data sources when needed. Data are given different reliability qualifications. Production and Intermediate are given a medium (M) reliability, but the value added is superior (S). This means we trust the result of output minus intermediate to be of higher quality than both transactions apart. The government data is considered of high (H) quality. These data are also included in the IEA, where they are fixed (F reliability), because those variables are used as exogenous variables. By using identities and ratio values this influences these government data in the SUT as well. In general, the breakdown by age groups is not readily available in the macro data and can only be obtained by confronting data sources that are not aligned. Thus, we regard the quality of these breakdowns as relatively poor (P).

Data sources for the Labour Accounts are for the largest part administrative data sources, which are considered of high (H) quality. The basic data in our system for total employment is fixed (F reliability), but employment by economic activity has a superior (S) prior reliability. A further breakdown by economic activity and age groups is considered still of high quality (H reliability).

For consumption, the data sources are regarded to be of lower (L) quality and coverage than other parts of the SUT. Total household final consumption is given a high (H) quality though, but the various breakdowns get a medium (M) (by CPC), or low (L) (by COICOP and age group) reliability. The output of NPI’s is based on surveys, establishment reports, and additional data. These are assessed as data relatively poor (P) quality. Total exports in the IEA are one of the exogenous variables, hence are given a fixed (F) reliability. Imports and exports in the SUT are considered superior (S) reliability because these are related to the fixed values of exports through identities and ratios. Finally, gross fixed capital formation is determined within the SUT, which is given a medium (M) reliability.

The integrated economic accounts (IEA) give an overview of the accounts of an economy, specifying them by institutional sector. The reliabilities in the SUT influence the sector accounts as well. For this reason, wages and mixed income in the household sector accounts get a superior (S) reliability. Within the IEA, the entire government sector has a fixed (F) reliability, because these are the transactions directly used as exogenous variables in our scenarios. Relative to other sectors data on the financial institutions are of superior (S) quality, as they rely for a large part on reports of the Dutch Central Bank. We consider the data of the non-financial corporations of high (H) quality, and the NPI data as poor. The macro HH sector data are assessed as data of medium (M) quality, but are coloured yellow in the framework, and, as was explained above, not used in the Bayesian estimation.

For the household sector breakdown by age groups, the Income Panel Survey (IPS) is available. The IPS describes the composition and distribution of income for individuals and households. It is a sample survey with data from different administrative sources, among which the tax authority. Regarding the use in the national accounts there are some limitations to this data source, which is why we give the breakdowns by age a low quality. These limitations concern different scope in transactions, population, or conceptual issues. The IPS does not cover the consumption of households. For this we used the Household Budget Survey (HBS). The HBS measures the consumption expenditures at the household level, therefore estimates by individuals are unavailable. We allocate consumption to individuals within the households by giving each adult a weight of 1 (one) and each child a weight of 0.8. These factors are derived by us from the equivalence scale as determined by Statistics Netherlands (CBS, 2004).

List of Concepts

Assets

In Chapter 2 of this thesis, household net worth is presented in accordance with the SNA framework. Net worth is defined as the total value of a household's assets minus its liabilities. We follow the SNA 2008 coverage of assets, which classifies them into two broad categories: financial assets and non-financial assets. Financial assets of households include instruments such as currency and deposits, bonds, equities, investment fund shares, loans extended, insurance and pension entitlements, and other accounts receivable. These represent claims on other institutional units and typically result in future financial payments or income. Non-financial assets include both produced assets, such as dwellings, other buildings and structures, and machinery and equipment, and non-produced assets, such as land. These are assets that contribute directly to household well-being or economic activity without representing a financial claim on another unit.

(Adjusted) Disposable income

In the SNA 2008, disposable income is the balancing item in the secondary distribution of income account (United Nations *et al.*, 2009). For households it is derived from the balance of primary incomes by adding all current transfers, except social transfers in kind, receivable; and subtracting all current transfers payable. It appears in two contexts, gross (which includes depreciation (consumption of fixed capital), and net (which excludes). Gross disposable income is the income concept used in chapter 2, for the joint analysis. Chapter 1 also uses this concept and extends it by including social transfers in kind, by which it becomes the **adjusted disposable income**. On top of this, the income concept in Chapter 4 also includes capital transfers receivable and payable, in order to align with the concepts suggested by the National Transfer Accounts (United Nations, 2013).

Disposable income in the microdata is defined in the Canberra manual (UNECE, 2011). Disposable income refers to total income minus current transfers paid. Transfers are considered quasi-compulsory when the household perceives that the transfer diminishes its capacity to consume or save, and when the transfer is made under a non-legally binding obligation or moral expectation—such as inter-household family support payments. This definition broadly aligns with the System of National Accounts (SNA) concept of disposable income, with the exception that, similar to gross income, disposable income here also encompasses certain forms of imputed property income, particularly investment income accrued by insurance and pension funds on behalf of households' insurance, annuity, or pension entitlements. Also incomes from the non-observed economy are not estimated and differences exist in conceptual similar items (i.e. some taxes are considered in the income sphere in the SNA, while they are consumption in the micro statistics). The micro concept of disposable income does not have a gross versus net recording. For a detailed discussion on the differences between micro and macro disposable income, see Bruil (2018; 2023)

Equivalised Income

Equivalisations of income is done to account for economies of scale within households and to enable more meaningful comparisons across different household types. In Chapter 1, we use the equivalised disposable income to rank households and compare their income levels. This is done using the OECD-modified equivalence scale, which assigns a weight of 1.0 to the first adult in the household, 0.5 to each additional household member aged 14 or older, and 0.3 to each child under 14. In contrast, Chapter 2 does not apply equivalisation to the disposable income measure, as equivalisation is primarily relevant for the analysis of consumption rather than saving. Chapter 4 employs equivalence scales differently: rather than adjusting income, it uses equivalisation to allocate household-level consumption to individuals, following the approach proposed by the National Transfer Accounts (NTA) framework. For this purpose, the CBS equivalence scale is used, which differs from the OECD-modified scale.

Finally, chapter 3 uses a different approach to compare incomes. Here the adult split approach is used. In our main analysis, we study inequality and redistribution at the level of individual adults, where "adults" refers to individuals above the age of 20. We apply the equal-split approach, where all of income, taxes and government spending is shared equally between adult members of the household.

Extended Net Worth

Extended net worth expands the traditional concept of net worth by including entitlements to public pension benefits. It is defined as the sum of household net worth (i.e. financial and non-financial assets minus liabilities) and the present value of accrued public pension rights. In Chapter 2, extended net worth is used to reflect the broader economic resources available to households over the life course. The estimation of public pension wealth follows Eurostat's *Technical Compilation Guide for Pension Data in National Accounts* (Eurostat, 2020), which provides a methodology for incorporating pension entitlements into national accounting aggregates.

Household

A household is defined in accordance with the System of National Accounts (SNA 2008) as "a group of persons who share the same living accommodation, who pool some, or all, of their income and wealth and who consume certain types of goods and services collectively, mainly housing and food. In general, each member of a household should have some claim upon the collective resources of the household. At least some decisions affecting consumption or other economic activities must be taken for the household as a whole."

Households are recognized as institutional units, meaning they are capable of owning assets, incurring liabilities, engaging in economic activities, and entering into contracts in their own name. A household may consist of a single person living alone or a group of individuals who share living arrangements and jointly manage resources such as income and consumption. Two types of households are distinguished: private households, and households in institutions. Private households are groups of individuals (or single individuals) living in private dwellings and functioning as economic units. These households may include family members or unrelated persons who pool resources and make collective decisions. Households in institutions, which refer to individuals living in collective living arrangements such as nursing homes, prisons, military barracks, or boarding schools. These persons are generally not considered to be part of private households, as their consumption and economic decisions are managed by the institutional setting. Throughout the entire thesis we focus on the total population of both private and institutional households. In chapter 1, we specifically examine the impact of excluding institutional households to assess the effects on inequality measures, given that such households are often omitted in micro statistics.

Additionally, it is important to note the difference between the individual and the household as units of analysis. While individuals are the ultimate economic agents—earning income, consuming goods, and owning wealth—data in the national accounts are often collected and presented at the household level. In chapter 3 we use the adult split to share the resources within the households equally over the adult household members. In Chapter 4, we estimate individual income flows either through direct observation—such as in the case of compensation of employees—or, for income components measured at the household level, by applying an equal-split method among household members.

Labour income

Labour income primarily consists of compensation of employees as defined in the System of National Accounts (SNA 2008), which includes wages and salaries in cash or in kind, as well as employers' social contributions. In addition to these direct payments, when labour income is presented in the thesis it may include a portion of *mixed income* from self-employment, which reflects both labour and capital input but cannot be separately identified. In chapter 1, 70% of mixed income is attributed to labour income to approximate the labour component of unincorporated enterprises. In chapter 3, labour income is strictly defined as compensation of employees. In chapter 4, labour income includes the *entire* amount of mixed income. Throughout the thesis, different methodological choices were made at various points in time, often in response to the specific analytical goals or prevailing practices of each chapter. In retrospect, a more consistent approach—preferably one more closely aligned with core national accounts concepts and avoiding arbitrary allocation rules—might have enhanced the overall coherence of the framework.

Liabilities

In Chapter 2, liabilities are examined in alignment with their definition as established in the System of National Accounts (SNA). These are obligations that require one institutional unit to make a payment or series of payments to another unit. They represent the counterpart to financial assets held by other sectors and reflect future economic claims on the debtor. The liabilities of households primarily consist of loans, which encompass all forms of borrowing. In the Netherlands, these are predominantly mortgage loans, which account for the bulk of household debt and are secured against residential property. Other forms of liabilities may include consumer credit, student loans, and overdraft facilities, though their relative share is much smaller in comparison to mortgage debt.

Lifecycle Surplus / Deficit

The lifecycle surplus or deficit reflects the balance between an individual's or age group's economic production and consumption over the course of life. It is calculated as the difference between labour income and consumption. A lifecycle surplus occurs when labour income exceeds consumption, typically during prime working ages. Conversely, a lifecycle deficit arises when consumption exceeds labour income, commonly in childhood and old age. Labour income includes the compensation of employees, and mixed income of self-employed. These concepts are central to the National Transfer Accounts framework (United Nations, 2013), which analyses economic flows across age groups and informs understanding of intergenerational support systems and the generational economy.

Macro data

Macro data refers to aggregated economic statistics that are consistent with the System of National Accounts (SNA 2008). In this thesis, macro data align with the national totals published by Statistics Netherlands. These figures serve as benchmarks for integrating micro-level data into a national accounts framework. In Chapters 1, and 2 macro data are aligned with the household sector of the sector accounts, ensuring consistency with the institutional approach to measuring household income, consumption, and wealth. In Chapter 3, macro totals are aligned with the entire economy rather than the household sector alone, following the methodology adopted by the World Inequality Lab (Blanchet *et al.*, 2021). Chapter 4 present macro data for a large part of the national accounts framework, but the relevant analysis adhere to the household sector totals, just as in chapter 1 and 2.

Micro data

Micro data refers to datasets that provide individual- or household-level information, capturing the distributional characteristics of a population rather than presenting only aggregate totals. In contrast to macro data, which offer aggregate figures for entire sectors or economies, micro data allow researchers to analyse variations in income, wealth, consumption, and other socio-economic variables across subgroups of the population.

The micro data for the Netherlands, used in this thesis, are primarily derived from administrative register sources, such as tax records, social insurance databases, and population registries. These sources offer high coverage, reliability, and consistency over time, making them well suited for distributional analysis. However, registers may not capture all relevant variables—particularly those related to informal income sources, or consumption. To address these gaps, household surveys are also integrated into the constructed households dataset.

Mixed income

In the SNA, mixed income is the balancing item for unincorporated enterprises owned by households in which household members may contribute unpaid labour. Because the return to labour and capital cannot be separately identified, this income is considered "mixed," combining both compensation for work and entrepreneurial profit. In addition to income earned by the self-employed, mixed income also includes estimated earnings from the non-observed economy, which are calculated at the macro level and subsequently allocated to households in the national accounts framework. In this thesis, mixed income is treated differently across chapters. In chapter 1, mixed income is split 70/30 between labour and capital income. In Chapter 4, however, the full amount is classified as labour income, in line with practices in the National Transfer Accounts (NTA) framework. In chapter 3 mixed income is not further broken down into labour and capital, which is perhaps the best option. This split primarily affects factor income components and does not affect the distribution of disposable income. Throughout the thesis, different methodological choices were made at various points in time, often in response to the specific analytical goals or prevailing practices of each chapter. In retrospect, a more consistent approach—preferably one more closely aligned with core national accounts concepts and avoiding arbitrary allocation rules—might have enhanced the overall coherence of the framework.

Net Asset Based Revenues

Net assets-based revenues represent the income generated from ownership of assets. They are calculated as the sum of operating surplus, net capital transfers, and property income received, minus property income paid. Operating surplus refers to income derived from the ownership of dwellings (i.e., imputed rent for owner-occupied housing). Property income includes returns on financial assets, such as interest, dividends, and rents, whether paid or received. This concept reflects the extent to which individuals or households can support consumption using income generated from their accumulated assets, independent of labour or transfers.

Net Worth

Net worth is defined, following the System of National Accounts (SNA), as the total value of financial and non-financial assets owned by a household minus its liabilities. It represents the accumulated wealth position of households at a specific point in time. In Chapter 2, net worth is used as the key measure for the analysis of household wealth. While "wealth" is commonly used in both public and academic discourse, "net worth" is the precise term used in national accounting frameworks.

Post-tax National Income

Post-tax national income is the income that individuals ultimately receive after the full operation of the tax-and-transfer system. It includes the effects of all taxes paid and government transfers received, encompassing both cash and in-kind benefits such as healthcare and education. This measure reflects the final distribution of economic resources and is most relevant for assessing living standards and the redistributive impact of fiscal policy.

Pre-tax Factor Income

Pre-tax factor income is defined as net national income measured before any redistribution through social insurance, taxes, or government spending. It represents the total income accruing directly to the factors of production—labour and capital—without accounting for public transfers or tax obligations. Under this measure, individuals such as retirees or the unemployed often report very low or no income, as it excludes social insurance benefits. Consequently, the observed inequality under this concept is highly sensitive to demographic factors and labour market conditions, such as age distribution and unemployment.

Pre-tax National Income

Pre-tax national income adjusts pre-tax factor income by accounting for social insurance mechanisms. Specifically, it subtracts social insurance contributions and adds social insurance benefits, thereby recognizing the role of these transfers in redistributing income across individuals. However, to ensure that the distribution remains consistent with the original factor income distribution, any net surplus or deficit in social insurance is allocated proportionally to pre-tax factor income, in line with the Distributional National Accounts (DINA) guidelines. This income concept provides a more balanced view of income before general taxation and public expenditure, though it does not fully capture the redistributive effect of social insurance systems.

Transfer surplus

The transfer surplus or deficit represents the net balance of all transfers received and paid by individuals or households. It is defined as the sum of taxes and social contributions paid, and social benefits received, including both cash and in-kind benefits. In addition, it includes net current transfers, such as transfers to and from private insurance schemes, inter-household transfers, and transfers involving non-profit institutions serving households (NPISHs).

A transfer surplus occurs when the value of transfers paid exceeds the value of transfers received, while a transfer deficit indicates that more is received than paid. This measure helps assess how different age groups or population segments contribute to or benefit from the transfer system over time.

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Summary

This thesis originates from the need to incorporate distributions into the national accounts, as aggregate indicators such as GDP or disposable income provide only a partial view of welfare. Conventional inequality statistics omit key components of household resources—such as pensions, in-kind transfers, and retained earnings—and thereby risk distorting our understanding of inequality and its policy implications. The central research question is how inequality changes when measured within the framework of the national accounts. Addressing this question requires reconciling detailed administrative microdata with the coherent structure of the System of National Accounts (SNA) and assessing how definitional choices affect both national estimates and international comparability.

The empirical foundation is a micro-founded database of household income, consumption, savings, and wealth. By combining administrative and survey data with macroeconomic aggregates, the database enables the allocation of the full sequence of national-account transactions to individual households.

The scientific relevance of the thesis lies in three contributions. First, it advances inequality measurement by incorporating components typically omitted from conventional statistics—pension entitlements, retained earnings, and in-kind transfers—thereby offering a more complete view of household resources. Second, it provides a methodological innovation by aligning detailed microdata with the macro framework of the national accounts, creating distributional measures that are both granular and nationally consistent. Third, it integrates the national accounts with the National Transfer Accounts (NTA) system, enabling the analysis of how demographic change reshapes economic flows and distributional outcomes across age groups. Together, these contributions strengthen the empirical foundations of inequality research and enhance the comparability and policy relevance of distributional statistics.

The findings show that income inequality is higher when measured in line with the national accounts. The Gini coefficient rises once all income components are covered, while redistribution through taxes, social contributions, and in-kind benefits substantially reduces disparities. Wealth inequality, overstated in conventional statistics, falls markedly once occupational and public pensions are included. Including retained earnings in the households income reveals that effective tax rates are broadly flat for most households but drop sharply

at the very top. Finally, extending the framework to age profiles demonstrates how demographic change alters economic flows, with population ageing increasing lifecycle deficits and reliance on asset income.

Samenvatting

Dit proefschrift komt voort uit de noodzaak om verdelingsinformatie te integreren in de nationale rekeningen, aangezien macro-economische indicatoren zoals het bbp of het beschikbaar inkomen slechts een beperkt beeld van welvaart geven. Conventionele ongelijkheidsstatistieken laten belangrijke onderdelen van de middelen van huishoudens buiten beschouwing—zoals pensioenen, uitkeringen in natura en ingehouden winsten—waardoor zowel ons inzicht in ongelijkheid als de beleidsimplicaties ervan vertekend kunnen raken. De centrale onderzoeksvraag is hoe ongelijkheid verandert wanneer zij wordt gemeten binnen het kader van de nationale rekeningen. Dit vraagt om het combineren van gedetailleerde administratieve microdata met de samenhangende structuur van het Systeem van Nationale Rekeningen (SNA) en om het analyseren van de invloed van conceptuele keuzes op nationale uitkomsten en internationale vergelijkbaarheid.

De empirische basis is een micro-database van huishoudinkomen, consumptie, besparingen en vermogen. Door administratieve en enquêtegegevens te koppelen aan macro-aggregaten uit de nationale rekeningen wordt het mogelijk om het volledige rekeningstelsel van de nationale rekeningen toe te wijzen aan individuele huishoudens.

De wetenschappelijke relevantie ligt op drie vlakken. Ten eerste verbetert dit proefschrift de meting van ongelijkheid door componenten te integreren die in conventionele statistieken ontbreken—pensioenrechten, ingehouden winsten en uitkeringen in natura—en zo een vollediger beeld van de middelen van huishoudens te bieden. Ten tweede introduceert het een methodologische vernieuwing door microdata systematisch te koppelen aan het macro-raamwerk van de nationale rekeningen, wat leidt tot verdelingsstatistieken die zowel gedetailleerd als nationaal consistent zijn. Ten derde wordt het SNA geïntegreerd met het National Transfer Accounts (NTA)-systeem, waardoor kan worden geanalyseerd hoe demografische veranderingen economische stromen en verdelingsuitkomsten over leeftijdsgroepen beïnvloeden. Gezamenlijk versterken deze bijdragen de empirische basis van ongelijkheidsonderzoek en vergroten zij de vergelijkbaarheid en beleidsrelevantie van verdelingsstatistieken.

De resultaten tonen dat inkomensongelijkheid hoger uitvalt wanneer zij wordt gemeten binnen de nationale rekeningen. De Gini-coëfficiënt stijgt zodra alle inkomenscomponenten zijn meegenomen, terwijl herverdeling via belastingen, sociale bijdragen en uitkeringen in natura de ongelijkheid aanzienlijk vermindert. Vermogensongelijkheid, die in conventionele statistieken wordt overschat, daalt sterk wanneer tweede- en eerste-pijlerpensioenen worden meegerekend. Door ingehouden winsten aan het inkomensbegrip van huishoudens toe te voegen wordt duidelijk dat de effectieve belastingdruk voor de meeste huishoudens grotendeels vlak is, maar scherp afneemt aan de absolute top. Tot slot maakt de uitbreiding met leeftijdsprofielen duidelijk hoe vergrijzing de economische stromen beïnvloedt, met grotere levenscyclus-tekorten en een toenemende afhankelijkheid van vermogensinkomen tot gevolg.

Relevant International Expert Groups and Networks (Author Participation)

Expert Group on Disparities in a National Accounts Framework (EGDNA)

The Expert Group on Disparities in a National Accounts framework is a group of experts convened under the auspices of international statistical organizations (it started as a joint OECD-Eurostat initiative, but is currently run by the OECD solely), to develop guidelines and methods for integrating distributional information—for income, consumption, and savings — into the system of national accounts (SNA). Its aim is to ensure that macroeconomic aggregates align with micro-distributional data in a coherent framework, enabling policymakers to assess both economic performance and social equity using consistent concepts. This group plays a key role in the development of Household Distributional Accounts. The OECD leads the work on distributional household income, consumption, and savings within the DGI-III initiative through its coordination of the Expert Group on Disparities in a National Accounts framework (EGDNA).

Task Force on Household Distributional Accounts (TFHDA)

The Task Force on Household Distributional Accounts (TFHDA) is a working group established by Eurostat with the objective of improving the measurement and consistency of distributional indicators for the household sector within the national accounts framework. The task force brings together experts from national statistics institutes and international organizations to develop harmonized methodologies for aligning microdata (such as household surveys) with macroeconomic aggregates from the System of National Accounts (SNA). This work supports the production of Household Distributional Accounts, which provide insight into how income, consumption, and savings are distributed across household groups—by income, composition, or socio-economic characteristics—while remaining consistent with national accounts totals. The TFHDA plays a central role in advancing distributional statistics for policy and research across the EU.

Expert Group on Distributional Financial Accounts (EGDFA)

The Expert Group on Distributional Financial Accounts (EGDFA) is an initiative coordinated by the European Central Bank (ECB) that focuses on enhancing the consistency and timeliness of distributional wealth data in the euro area. Its main objective is to bridge micro-level data on household wealth—primarily from the Household Finance and Consumption Survey (HFCS)—with macroeconomic aggregates from the national financial accounts. By doing so, EGDFA enables the production of wealth distribution estimates that are consistent with the totals reported in official macroeconomic statistics. The group plays a key role in improving the coverage, comparability, and policy relevance of household wealth statistics for economic and monetary analysis.

Expert Group on Distributional Household Wealth (EGDHW)

The Expert Group on Distributional Household Wealth (EGDHW) is a working group established by the Organisation for Economic Co-operation and Development (OECD) to support the development of distributional measures of household wealth that are consistent with macroeconomic statistics. The group focuses on integrating micro-level survey data (such as household wealth surveys) with the System of National Accounts (SNA), aiming to produce high-quality, internationally comparable distributional wealth indicators. EGDHW brings together national experts, statisticians, and researchers to share best practices, address methodological challenges, and improve the coverage and coherence of wealth data across OECD countries. The OECD leads the work on distributional household wealth within the DGI-III initiative through its coordination of the Expert Group on Distributional Household Wealth (EGDHW).

The National Transfer Accounts (NTA) Network

The National Transfer Accounts (NTA) Network is a global research and policy initiative that measures economic flows across generations, offering a comprehensive framework for analyzing the generational economy. It captures how people at different ages produce, consume, save, and share resources, both through markets and public systems. The NTA approach enables detailed assessments of intergenerational equity, the fiscal sustainability of aging populations, and the design of social protection systems. These efforts have culminated in the development of a statistical manual published by the United Nations Statistical Division, establishing NTA as an internationally recognized methodology for integrating age into economic accounts.

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This thesis contains four chapters, all addressing different aspects of economic inequality from the perspective of the national accounts. The central question is how our understanding of inequality changes when measured within this comprehensive framework.

Chapter 1 studies the distribution of household income and compares the outcomes with experimental results from other countries. Chapter 2 examines the role of pension entitlements and their impact on wealth inequality. Chapter 3 broadens the perspective beyond the household sector to the entire economy, attributing retained corporate earnings to their ultimate owners. Finally, Chapter 4 introduces the age dimension by applying the methodology of National Transfer Accounts, highlighting how population ageing reshapes the economic life cycle.

Arjan Bruil (1981) graduated in Economics from the University of Groningen. He currently works at Statistics Netherlands in the National Accounts department, where he coordinates the daily activities for the household sector and parts of the financial institutions. In addition, he is actively involved in various international expert groups and task forces dedicated to integrating distributional information into the system of national accounts. Over the years, he has contributed to the methodological development and international comparability of inequality measures, linking detailed microdata with macroeconomic aggregates.

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