

Inequality and Redistribution in the Netherlands*

Arjan Bruil¹, Céline van Essen², Wouter Leenders³, Arjan Lejour^{2,4},
Jan Möhlmann², and Simon Rabaté^{2,5}

¹Statistics Netherlands (CBS)

²Netherlands Bureau for Economic Policy Analysis (CPB)

³University of California, Berkeley

⁴Tilburg University

⁵French Institute for Demographic Studies (Ined)

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Abstract

This paper uses rich, comprehensive administrative data to study income inequality before and after government redistribution in the Netherlands. Leveraging a newly created corporate ownership registry, we are able to link profits to shareholders, capturing a form of income particularly prevalent at the top of the distribution. We show that tax progressivity is determined by the interplay of regressive consumption and payroll taxes and progressive income and corporate taxes. At the very top, the effective individual income tax rate is nearly zero and the only significant tax paid is the corporate tax. On the spending side, we use exceptionally precise data on receipt of both cash and in-kind spending to study their redistributive impact and to assess the validity of methods typically used to assign in-kind spending to individuals. Finally, we investigate inequality and redistribution across age, gender and geography.

JEL codes: D3, H2, H3, H5

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1 Introduction

The level of inequality is a defining characteristic of human societies. This level has varied greatly throughout history, with egalitarian hunter-gatherer groups being replaced by more unequal agricultural, industrial and, ultimately, post-industrial societies.¹ In each society, collective institutions such as the family, the corporation and the government shape how income is (re)distributed, often with the explicit goal of limiting inequality (Saez, 2021).² This last institution has, measured by its expenditure, grown considerably since the start of the 20th century, from less than a tenth to close to half of national income (Piketty, 2020). Today, inequality, as measured by the share of income earned by the 10% of highest incomes, ranges from close to 70% in South Africa to just over 30% in a country like France (Chancel et al., 2022).

This paper studies income inequality in the Netherlands, both before and after redistribution through taxation and government spending. Following the growing literature on *Distributional National Accounts* (Blanchet et al., 2021), our inequality statistics are consistent with macroeconomic income concepts as measured by national statistics offices. We are able to provide an exceptionally detailed picture of inequality and the workings of government redistribution through a wide array of detailed administrative datasets covering the full Dutch population. Throughout our analysis, we demonstrate the importance of assumptions for the wider inequality literature and try to quantify the level of uncertainty involved in our own statistics. 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 the 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, undistributed profits dominate the incomes at the top. We use the corporate ownership registry to assign profits to shareholders, often through several layers of ownership. This registry further enables us to evaluate conventional methods used to assign profits to individuals, such as assigning profits proportional to equity wealth or dividends. Most importantly, these methods fail to capture the importance of negative profits and therefore understate income shares at the top in a given year.

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. 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.

¹In 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).

²Aversion 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).

Third, we investigate redistribution through government spending. Using precise data on both cash and in-kind transfers, we show that they are highest for the lowest income groups. Government spending is responsible for effectively all of the reduction in inequality: the top 10% share of income falls from 35.4% before to 33.0% after taxes and government spending. The detailed nature of our data allows us to investigate the biases in conventional methods to assign government spending to individuals and show that they tend to overstate overall redistribution.

Fourth, 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 find that redistribution has a sizeable effect on gender inequality while leaving regional inequalities largely intact. 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.

We contribute to the existing literature in five important ways. First, we contribute to the growing literature on the measurement of inequality by constructing distributional national accounts for the Netherlands. The need for adding a distributional dimension to macroeconomic statistics has long been recognised, e.g., by the Stiglitz-Sen-Fitoussi commission (2009), and has since been addressed by two research programs: the OECD’s Expert Group on Disparities in a National Accounts Framework (EGDNA)³ which focuses on the household sector, and the World Inequality Lab’s (WIL) Distributional National Accounts (DINA) which also consider the government and corporate sector.⁴ This paper follows the methodology developed by the latter group and provides the first inequality statistics for the Netherlands that are consistent with national income. In this sense, we improve on existing studies of inequality and redistribution in the Netherlands which only consider income earned and taxes paid by households.⁵ More than simply adding a country to the list of countries with distributional national accounts, we use the high quality of the administrative datasets at our disposal to critically review methodological choices made in the literature. This way, we gauge the importance of specific assumptions and document the direction and size of biases inherent in those assumptions.

Second, our analysis confirms the importance of retained earnings among the wealthy, as discussed by Kopczuk and Zwick (2020). Most profits are not distributed as dividends but retained within the firm. In the Netherlands, a corporate ownership registry allows us to link shareholders to closely-held businesses, even in cases of complex ownership structures. We show that when undistributed profits, which can be positive or negative, are excluded, incomes at the top of the distribution are understated, while those at the very bottom are overstated. This finding is in line with a number of studies that have used corporate registries to assign undistributed profits to individuals in Norway (Alstadsæter et al., 2016), Chile (Fairfield and Jorratt De Luis, 2016) and Canada (Wolfson et al., 2016). We further show the importance of retained earnings when studying return heterogeneity as in Fagereng et al. (2020) and Bach, Calvet and Sodini (2020).

³See Fesseau and Mattonetti (2013) and Zwijnenburg et al. (2021) for a review of this approach.

⁴See Piketty, Saez and Zucman (2018) and Garbinti, Goupille-Lebret and Piketty (2018) for the first applications and Blanchet et al. (2021) for extensive methodological guidelines.

⁵See e.g. Trimp and De Kam (2011), Caminada et al. (2021), Olsthoorn et al. (2017), Salverda (2019) and Bruil (2023).

Thirdly, we contribute to the literature on the taxation of the (super)rich as reviewed by Scheuer and Slemrod (2020) and Güçeri and Slemrod (2023). The (super)rich differ from others in that most of their income is tied to their ownership of businesses and can take many different forms: wages, dividends, capital gains or retained earnings. By using the ownership registry, we can link corporate taxes 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. (Forthcoming) for Italy, overstate the effective tax rate of the top 1%. In line with Bach et al. (2023) who focus on the very wealthy in France, we find that the personal income tax largely fails to tax the very wealthy and that the corporate tax only partially makes up for this.

Fourthly, we provide the most detailed evidence on the redistributive effect of in-kind transfers to date. While in-kind transfers often constitute the largest type of government spending, little is known about its effect on inequality. Most studies do not have access to exhaustive data on the receipt of government spending and instead have to rely on assumptions, such as assuming that government spending is distributed equally, as in Jestl and List (2022), or partly in proportion to income, as in Blanchet, Chancel and Gethin (2022). The most recent development has been to use 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 (2023a). We show that all of these methods fail to capture the substantial variance that exists in the receipt of in-kind transfers even conditional on income. By construction, the use of distributional incidence profiles guarantees that the average receipt of in-kind transfers matches that of the microdata. However, as this method does not allow for either an intensive or an extensive margin of transfer receipt conditional on income, it fails to consider inequality in the receipt of in-kind transfers within groups with a similar level of income. It therefore overstates the extent of redistribution more so than any of the other methods.

Finally, our results speak to the diverse literature on inequality across dimensions other than income, importantly age, geography and gender. 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. Furthermore, we can assign capital income to shareholders' locations instead of to a firm's headquarter's location, which tends to overstate capital income earned in capital cities. 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 almost 30%.

This paper is organised as follows. Section 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. Section 4 presents the results on the distribution of pre-tax income, while Section 5 does so for redistribution and post-tax income. Section 6 concludes.

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, around €44,000 per adult on average. Tax revenue amounted to 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 (15%), indirect taxes (12%), payroll taxes and mandatory health insurance premiums (12% of national income), the corporate tax (4%) and the inheritance tax (0.3%).

The Dutch income tax treats labour and capital income differently. 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 of profits and 25% on profits in excess of that. Profits related to research and development are taxed at a reduced rate of 5%.

The largest indirect tax is the Value Added Tax (VAT), which has a 21% standard rate and a 6% reduced rate. 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, contributions for unemployment and disability insurance, as well as contributions for sickness benefits. In addition, basic health insurance is mandatory and paid for through premiums which are unrelated to income.⁶ 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% of national income), 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” (6%). 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 detailed overview of the most important taxes and forms of government spending in Online 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. At the end

⁶To support households on low incomes, there exists a means-tested cash benefit that is nominally related to health insurance.

of 2016, pension funds owned financial assets worth 238% of national income. 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 makes it indispensable to carefully distinguish between retained earnings that accrue to foreign and Dutch shareholders, as well as between corporate taxes that are ultimately paid by foreign and Dutch shareholders.

3 Methodology and data

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 those corporations, even if they refrain from paying out dividends. In measuring redistribution, we consider all taxes 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 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. 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, pre-tax 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 factor income 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. This concept allows us to measure government redistribution and decompose it into effects of the progressivity of taxation and government spending respectively.

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.

3.2 Data sources

Microdata We build on and refine the work by Bruil (2023) who constructed a first type of distributional national accounts for the household sector. 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. In order to fully exploit the depth of the available datasets, our analysis focuses on one year only, 2016, leaving the construction of a time series for future research.

Municipal registers provide information on basic demographic variables (date of birth, gender) as well as household composition and location. 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.

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 annual corporate 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 of the registry is that it only covers firms registered in the Netherlands. While we do observe dividends received from foreign firms, we cannot capture earnings retained by those firms.

For all important cash and in-kind transfers, we observe the receipt of these transfers, either in monetary terms or in terms of real consumption. For education, we observe the type of education as well as the number of months a student is enrolled for. 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. For transfers that are paid out in cash, which includes all cash transfers as well as specific in-kind transfers such as child care allowances and rental support, we observe the precise amount received by each household. 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 the VAT, excise taxes and other indirect taxes. A detailed description of each of the different datasets can be found in Online Appendix B.

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.⁷

4 Inequality of pre-tax income

4.1 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, the return on pension entitlements, imputed rent, mixed income and a small residual category of “other income” which mostly consists of imputed production taxes. The more than 13 million adults living in the Netherlands in 2016 earn an average pre-tax factor income of €44,371, but this masks a substantial degree of inequality which we show in Table 1. As discussed in Section 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 €12,280 for the bottom 50% of adults. The bottom 50% income share is only 13.8%, while that of the top 10% is 38.0%, leaving 48.2% for the middle 40% (P50-P90).

⁷These estimates are part of an internal update of a report on the Dutch current account (De Nederlandsche Bank, 2013).

Table 1: The distribution of pre and post-tax income in 2016

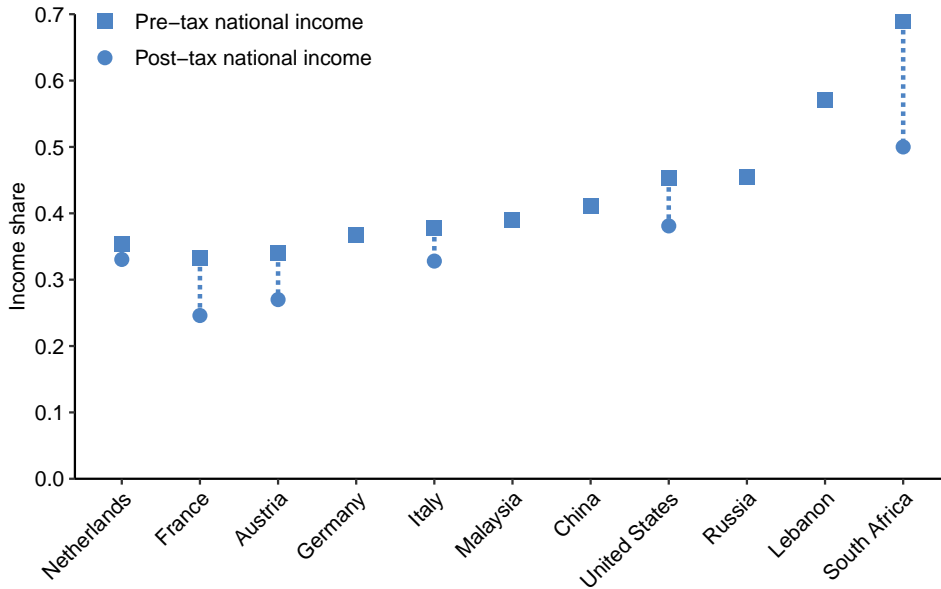
Income group	Number of adults	Pre-tax factor income			Pre-tax national income			Post-tax national income		
		Income threshold	Average income	Income share	Income threshold	Average income	Income share	Income threshold	Average income	Income share
Full population	13,332,368		€44,371	100.0		€44,371	100.0		€44,608	100.0
Bottom 50%	6,666,184		€12,280	13.8		€18,997	21.4		€21,683	24.3
Middle 40%	5,332,947	€33,423	€53,426	48.2	€34,055	€47,868	43.2	€34,744	€47,562	42.6
Top 10%	1,333,237	€84,180	€168,606	38.0	€72,072	€157,252	35.4	€69,966	€147,416	33.0
Top 1%	133,324	€235,809	€627,988	14.2	€227,520	€631,251	14.2	€205,691	€588,157	13.2
Top 0.1%	13,333	€1,017,294	€2,672,599	6.0	€1,031,667	€2,727,935	6.1	€958,379	€2,591,607	5.8
Top 0.01%	1,334	€4,309,485	€10,870,442	2.5	€4,410,460	€11,128,485	2.5	€4,187,120	€10,707,649	2.4
Top 0.001%	134	€18,790,796	€40,600,656	0.9	€19,251,148	€41,590,986	0.9	€18,776,679	€40,251,190	0.9
Top 0.0001%	14	€89,376,807	€112,625,213	0.3	€91,598,229	€115,421,767	0.3	€90,766,625	€113,078,444	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 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 factor income. The 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 21.4% at the expense of the middle 40% and top 10%, whose shares fall to 43.2% and 35.4%, 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%, which could be thought of as the Netherlands’s billionaires.⁸⁹ Comparing the Netherlands to other countries, we show in Figure 1 that pre-tax 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.¹⁰

Figure 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. (Forthcoming) 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.

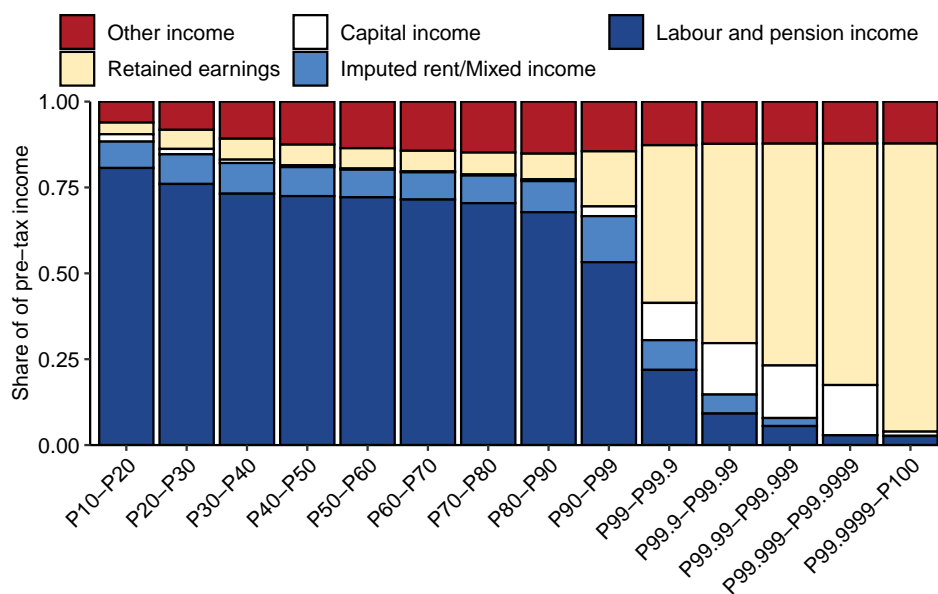
⁸According to the magazine *Quote*, which compiles the Dutch annual rich list, 18 billionaires lived in the Netherlands in 2016. Our ranking of individuals is based on income rather than wealth, but the inclusion of retained earnings means that there is considerable overlap between top income earners and top wealth holders.

⁹It 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.

¹⁰These statistics are taken from Bozio et al. (2024), Jestl and List (2022), Bach, Bartels and Neef (2023), Guzzardi et al. (Forthcoming), Khalid and Yang (2021), Piketty, Yang and Zucman (2019), Piketty, Saez and Zucman (2018), Novokmet, Piketty and Zucman (2018), Assouad (2023) and Chatterjee, Czajka and Gethin (2023). 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.

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 2 how each income group’s income derives from different income 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 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.

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.¹¹ 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 of €81.9 billion or 14% of national income. Almost 60% of these earnings were retained by domestic firms (€47.6 billion), while the remainder was retained by firms abroad. The corporate taxes that ultimately accrue to Dutch households amounted to €19.7 billion.

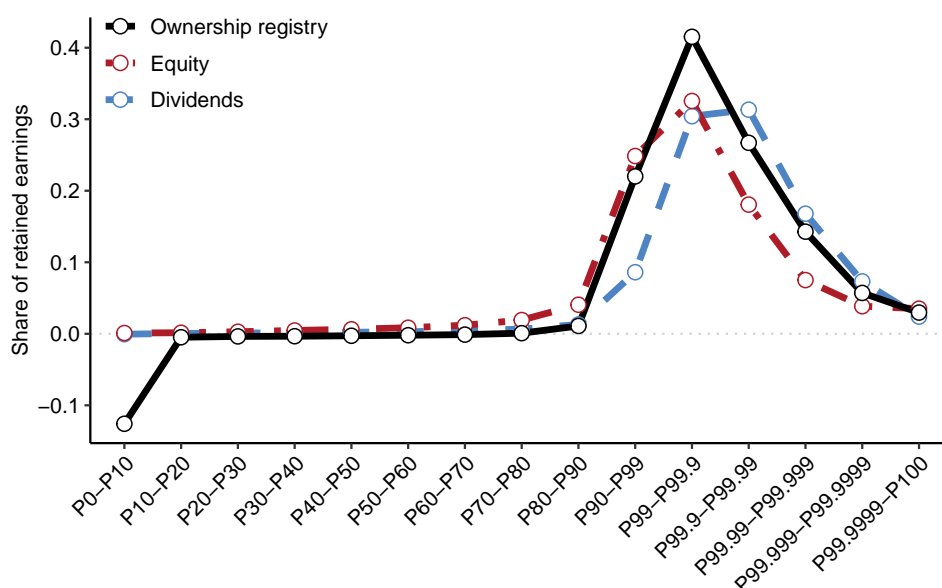
¹¹We provide a step-by-step account of how we make this distinction in Online Appendix C.1.

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 €34.4 billion of earnings retained by closely-held businesses that can be traced back 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 widely-held firms. This yields an estimate of earnings retained by widely-held firms attributable to households through their equity ownership of €2.4 billion. We assign this €2.4 billion 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 €36.8 billion. The remaining earnings retained by domestic firms, €47.6 billion minus €36.8 billion, 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 factor income. In Table A.1, we show the impact of including retained earnings in our definition of income. The top 10% income share falls from 35.4% to only 29.2% when we exclude retained earnings.¹² The discrepancy only grows when zooming in on the top: ignoring retained earnings understates the income share of the top 0.0001% by a factor 3. Income groups below the top 10% of earners 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 allocate retained earnings in proportion to either equity wealth or dividends. Each of these methods has distinct problems and the richness of our data allows us to explore them. We do this in Figure 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. As a result, the income shares at the bottom, where much of these negative retained earnings would end up, are overstated. Conversely, negative and positive retained earnings cancel each other in the aggregate which dampens top income shares. Concretely, we show in Figure A.4 that the equity and dividend allocation methods understate the top 10% income share by as much as 3% (1.2%-points).

¹²The pre-tax income shares that exclude retained earnings are similar to those found in earlier work by Caminada et al. (2021).

Figure 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 correlation 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.5 that the share of profits distributed falls sharply up until the 90th percentile. It is then relatively flat within the top 10%, with the notable exception of the top 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 stock.

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.6 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.¹³ 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 to 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 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.

5 Redistribution

5.1 From pre-tax to post-tax national income

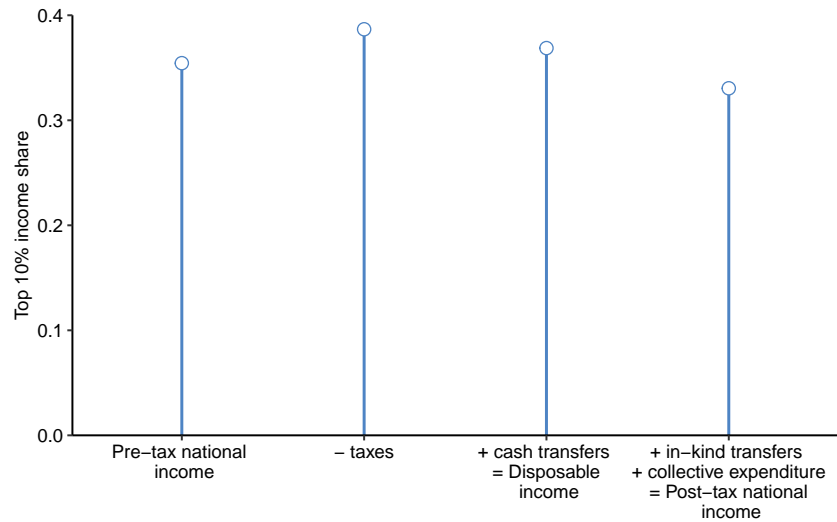
Post-tax national income is obtained by adding all forms of government spending to and subtracting all taxes from pre-tax national income. This is the income that can be used to accumulate wealth or to consume private and public goods and services. We show the transition in the top 10% share of income as we move from pre-tax to post-tax income in Figure 4. 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 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 and €25,000 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. Such large amounts are typically associated with health care and long-term care and can push low pre-tax income

¹³We 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).

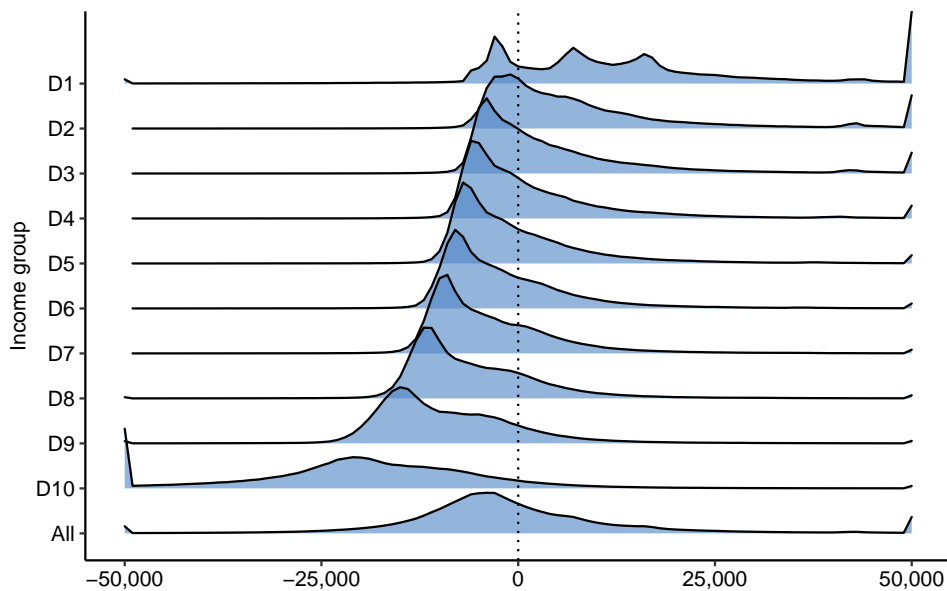
individuals into high post-tax income groups. We divide the remainder of this section into three parts: we discuss taxation in section 5.2, government spending in section 5.3, and the relation between redistribution and various demographic characteristics in section 5.4.

Figure 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 5: The distribution of government spending received net of taxes paid 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.

5.2 Anatomy of redistribution: taxes

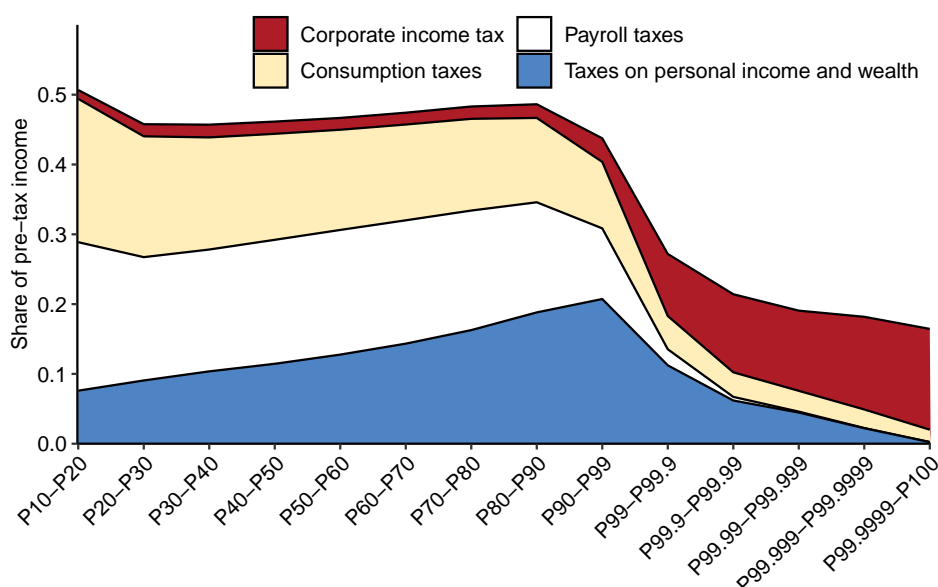
In our analysis of redistribution, we consider all taxes and divide them into four broad categories: taxes on income and wealth, corporate taxes, payroll taxes and consumption taxes. In line with the *Distributional National Accounts* methodology, we assign taxes to the corresponding factor of production: 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. This differs from analysing the incidence of (hypothetical) tax reforms which studies how pre-tax and post-tax incomes change in response to changes in tax rates or bases.¹⁴

The macroeconomic effective tax rate in the Netherlands is equal to 45% of pre-tax national income. Figure 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. 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 around 20% for the top 0.0001%.¹⁵ This regressive profile means that inequality increases due to the operation of the tax system, as can be seen in Figure 4. The top 10% income share increases from 35.4% for pre-tax national income to 38.7% when taxes are deducted.

¹⁴For a more elaborate discussion of the distinction between the distributional analysis of the current tax system and that of tax reforms, see Saez and Zucman (2023).

¹⁵There exists a tradition of estimating the distribution of the tax burden in the Netherlands, but these notably exclude undistributed profits 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 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.10, we document how the tax burden profile changes when we assign undistributed profits and corporate taxes proportionally to either equity wealth or dividends instead of when we rely on the ownership registry. The equity and dividend methods somewhat overstate the tax burden of the top 1%, this sensitivity check confirms 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.¹⁶ On average the Dutch tax burden lies above that of the US at a level similar to that of France, but Figure 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.¹⁷ Tax progressivity is ultimately determined by the interplay of two types of taxes, as we show in Figure 8: consumption and payroll taxes which tend to be regressive and corporate and personal taxes on income which tend to be progressive.

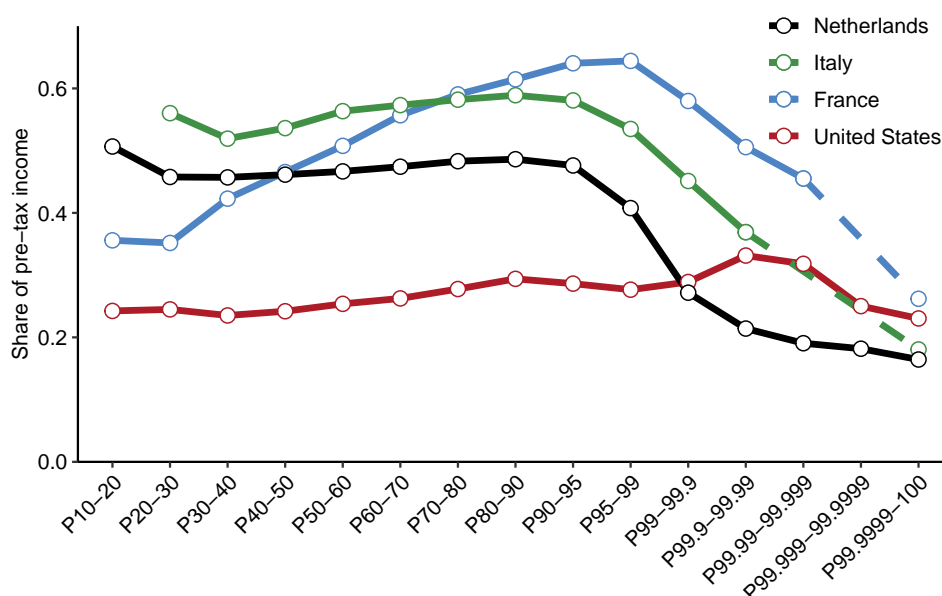
Consumption taxes are typically regressive because the consumption rate falls with income

¹⁶For 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. (Forthcoming) 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, 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.

¹⁷It 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.

(Blasco, Guillaud and Zemmour, 2023), as is the case in the Netherlands (see Figure C.1).¹⁸ 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.8).¹⁹ 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 undistributed profits and capital income. Secondly, payroll taxes often feature thresholds above which no additional tax is levied. As a result, the average payroll tax burden falls rapidly when income exceeds these thresholds.²⁰

Figure 7: The effective tax rate in the Netherlands, Italy, France and the United States



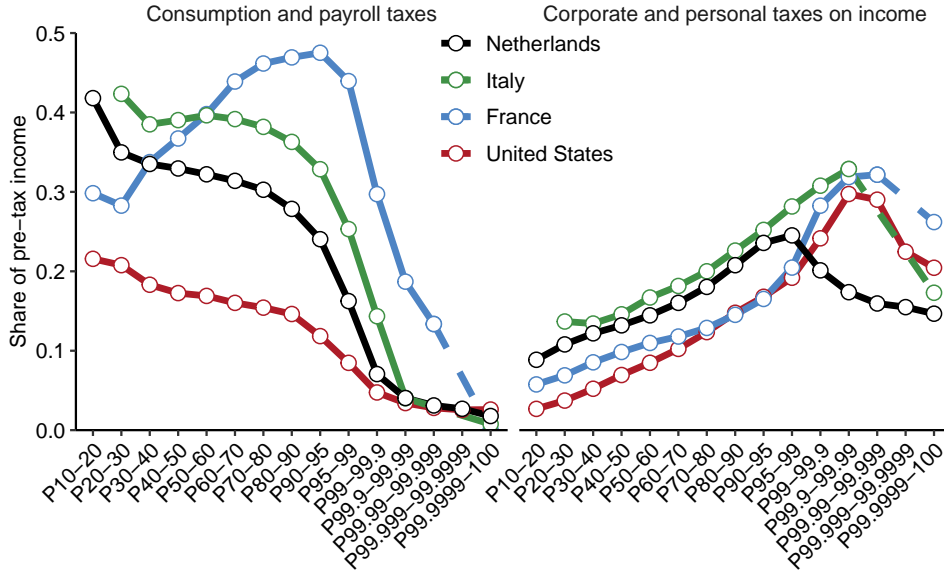
NOTE: This figure shows the effective tax rate faced by each income group in the Netherlands in 2016, and a number of countries for which comparable estimates are available. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. For Italy, we use the 2015 profile from Guzzardi et al. (Forthcoming); 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.

¹⁸Consumption 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.

¹⁹Bettendorf 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.

²⁰France 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 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.²¹ 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.9).²² This is only partially offset by the corporate income tax whose headline rate lies considerably below top income tax rates but which is levied regardless of whether profits are distributed and therefore acts as a sort of minimum tax for the very wealthy.

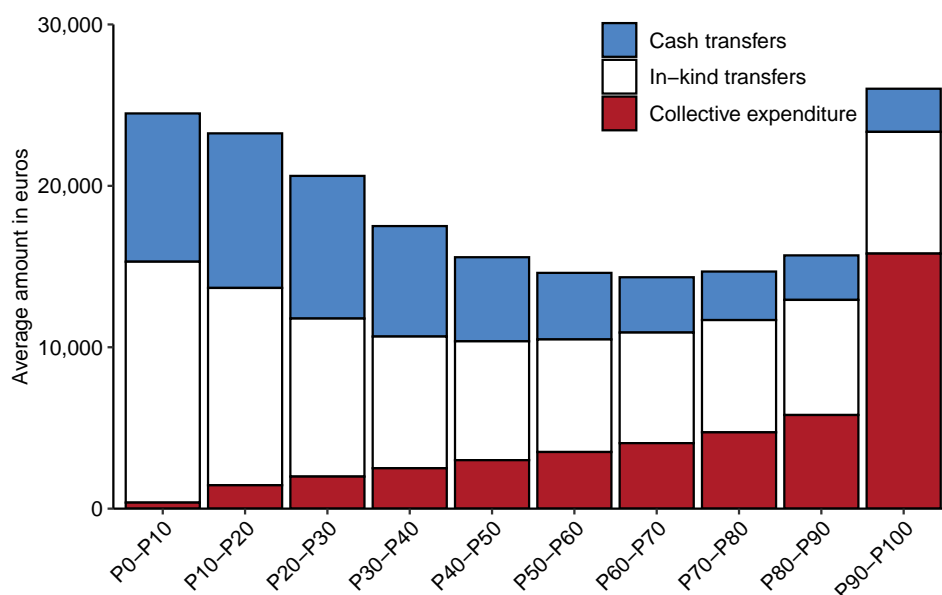
5.3 Anatomy of redistribution: spending

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. We show in Figure 9 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 would be starker if transfers were expressed as a share of income rather than in absolute amounts.

²¹The progressive profile of the Dutch income tax has also been documented by Caminada et al. (2021).

²²Yagan (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.

Figure 9: The average amount of government spending received by each income group



NOTE: This figure shows the amount of government spending received for 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.

Government spending can be divided into collective expenditure, in-kind transfers and cash transfers. Collective expenditure refers to government spending which is deemed non-individualisable. 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 larger properties.²³²⁴ In line with the literature, we have decided to treat collective expenditure in a distributionally neutral manner and assign it proportionally to disposable income.

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 A.11. 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

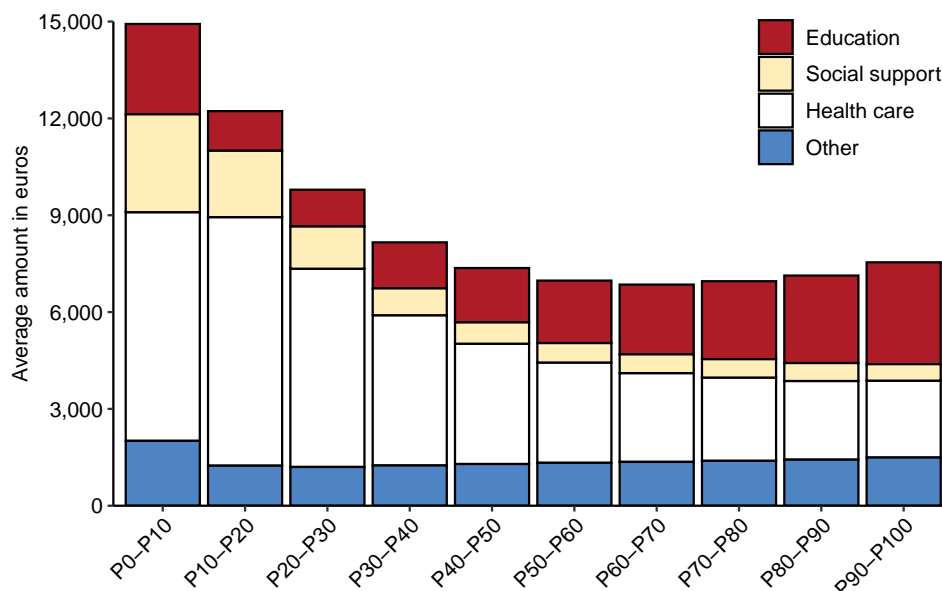
²³The notion that the benefits of the protection of property offered by the state accrue largely to those who own property has historically been an important argument for the introduction of proportional or progressive tax schedules. See Seligman (1908) for a critical history of these arguments.

²⁴Even 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).

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 some amount of cash transfers.

Finally, 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 may 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 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.12. 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.

Figure 10: The average amount of in-kind transfers received by each income group



NOTE: This figure shows the amount of in-kind transfers received for 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 then that

education spending increases with income. This is not necessarily the result of unequal access to tertiary education, but rather because the likelihood of having children increases strongly with income, as we show in Figure A.16.²⁵ At the bottom, less than 30% of adults is part of a household with children, while over 50% of the top decile is.

Taken together, taxation and government spending reduces income inequality, as illustrated in Figure 4 which shows how the top 10%'s income share evolves when we subtract and add each component to pre-tax national income.²⁶ Inequality reaches its highest level after removing taxes from pre-tax income, and is reduced by cash and in-kind transfers. The latter 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 resort to crude assumptions regarding their distribution due to a paucity of data. Since we directly observe the receipt of most in-kind transfers at the individual level, we are able to investigate the accuracy of the different methodologies used to assign in-kind transfers to individuals to date and more generally assess the sensitivity of inequality statistics to different methodological choices.²⁷

The most simple method for assigning in-kind transfers is to assign each adult the same amount (the *Lump-sum* method).²⁸ A slightly more refined 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 (*WIL*). 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. Even when researchers do not have access to microdata covering the entirety of health care consumption, its distributional assumptions can be refined using tabulated data on average health care consumption by income group as done by André, Germain and Sicsic (2023) and Gethin (2023b) (*Tabulated data*).

How do these different methods compare to assigning in-kind transfers on the basis of their actual receipt? First of all, 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 redis-

²⁵We 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.

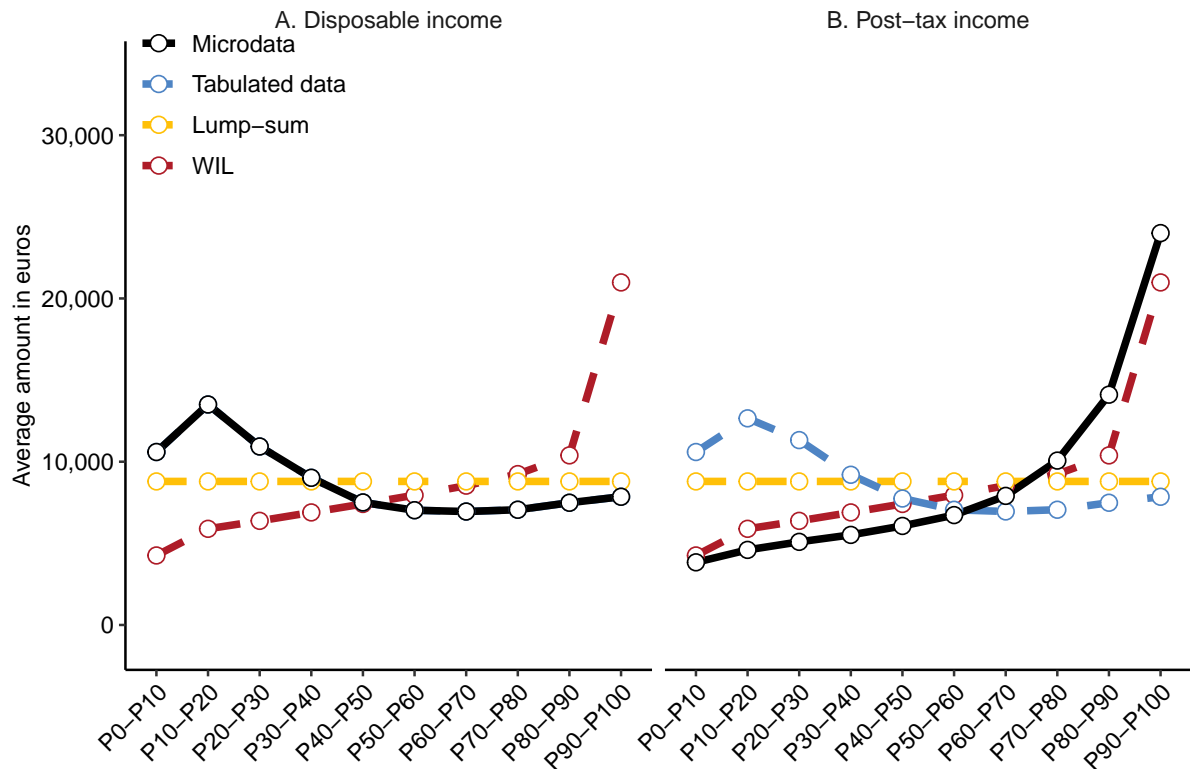
²⁶Figure A.7 shows the same evolution but for the Gini coefficient.

²⁷An 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.

²⁸In their preferred specifications, Jestl and List (2022) and Bozio et al. (2024) use the lump-sum method.

tribution for the wrong reasons. As we saw in Figure 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 Figure 11. The use of tabulated data overcomes this bias by construction since it matches the average amount of transfers received by each pre-tax income group.

Figure 11: 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 for 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.

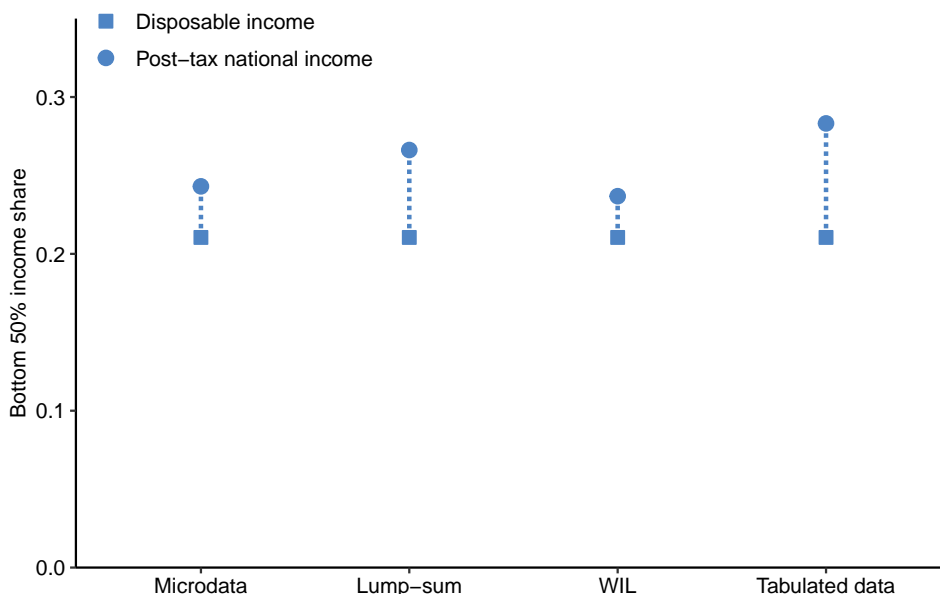
All of these methods suffer from a second type of bias, however. They assign the same amount of in-kind transfers to individuals with the same level of income and therefore ignore inequality in the receipt of in-kind transfers conditional on income.²⁹ This inequality can be considerable, as we show in Figure A.13: most individuals receive in-kind transfers below a few thousand euros, but a non-negligible group receives transfers in excess of €30,000. When we do assign in-kind transfers based on their actual receipt, individuals who receive a lot of in-kind

²⁹This concern can be mitigated if the tabulated data provides information on dimensions other than income, such as age or region.

transfers 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 11. 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 12 how the redistributive impact of in-kind transfers varies by methodological choice. 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.

Figure 12: 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.

Discussion of the post-tax income concept The results of our analysis emphasise 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. It is important to note, however, that we have thus far only considered inequality in income and have not made any claim regarding welfare. 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.

Furthermore, it is 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 policies 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.

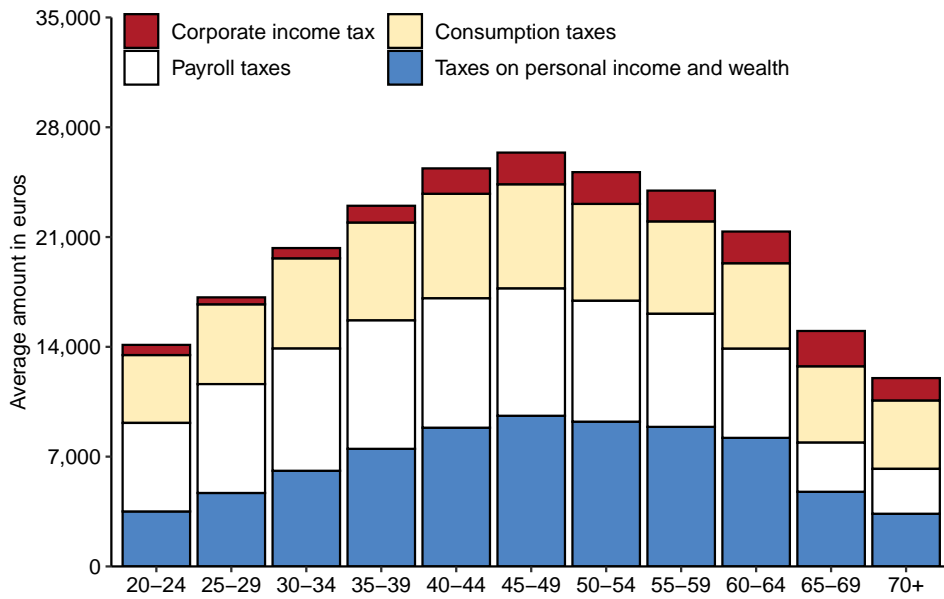
5.4 Redistribution across social groups

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 with other administrative data, we can study many of these different dimensions of redistribution.³⁰

To take age as an example, we show how the average tax burden varies with age in Figure 13. 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.14. The only tax category that increases roughly monotonically with age is the corporate income tax, reflecting the higher concentration of equity ownership, both directly and indirectly through pension funds, among the old.

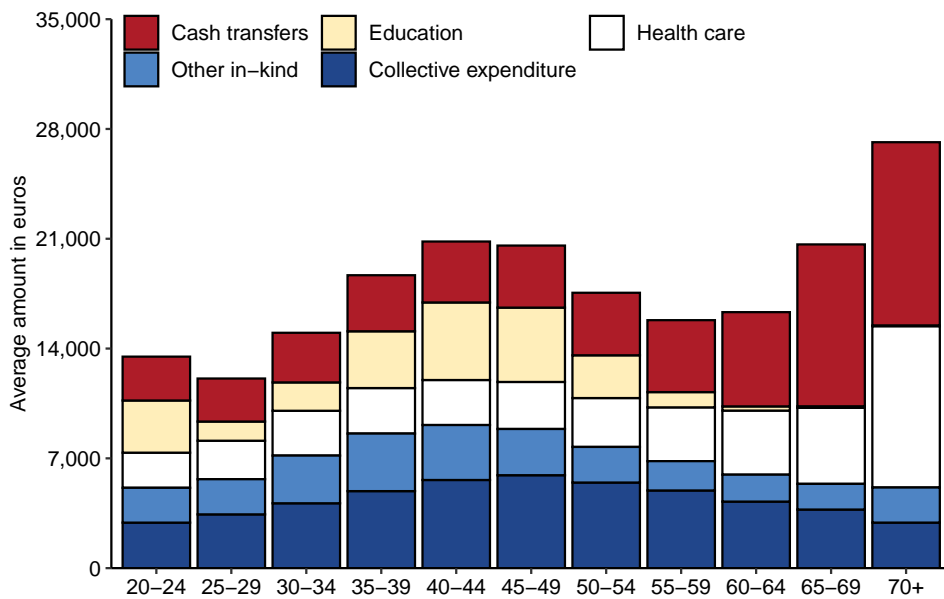
³⁰ André, Germain and Sicsic (2023) also study inequality and redistribution across social groups.

Figure 13: The payment of taxes 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.

Figure 14: The receipt of government spending by age



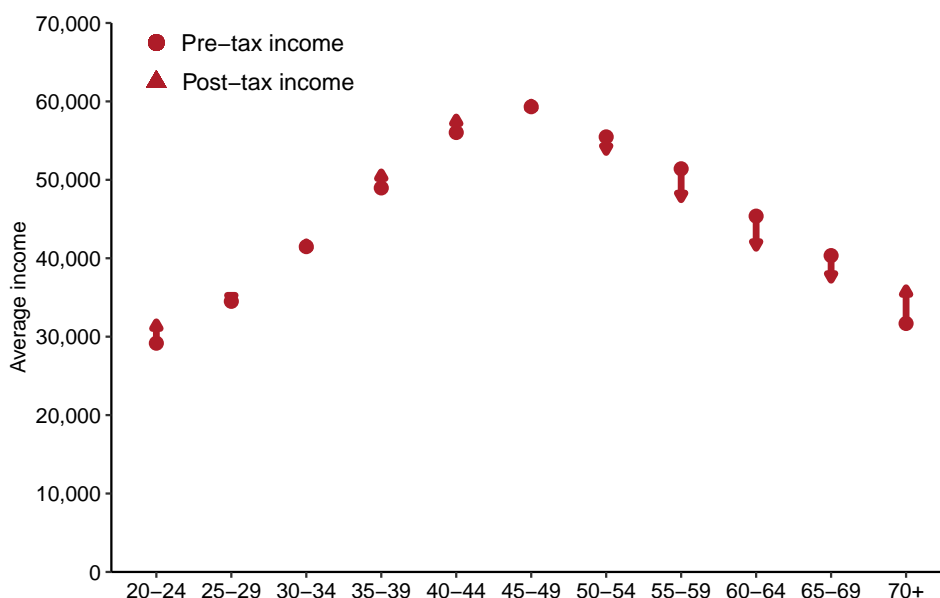
NOTE: This figure shows the value of government spending received for different age groups in 2016. The unit of analysis is the individual adult. All cash and in-kind transfers are assigned to the individuals who receive them. Collective expenditure is assigned to individuals in proportion to their disposable 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.³¹ The receipt of health care-related transfers increases with age, but most clearly so for the 70+ age group, in part because of the large public long-term care sector in the Netherlands.

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. Interestingly, most 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 national income. When considered in a static framework like 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 15: 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 16. 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 distrib-

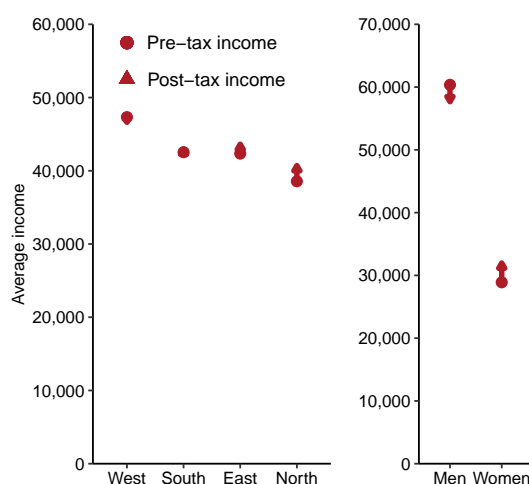
³¹We show in Figure A.15 what share of adults in each income group belongs to which age group. In Figure A.16 we show the prevalence of different household types across the income distribution.

uted and undistributed profits. Importantly, these profits are assigned to the locations where a firm's shareholders live rather than to the headquarters' location, which would overstate the income earned in capital cities, or the locations where the production takes place. 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 considerable geographic inequality in pre-tax income between NUTS1 regions, with an average of over €47,000 in the west of the Netherlands and less than €39,000 in the north.³² 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 standard 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 €32,000 for pre-tax income to €26,000 for post-tax income. This reduction is not the result of taxes or spending programmes that, conditional on income, disproportionately benefit women, but rather a reflection of the fact that women are more likely to be found at the bottom of the income distribution, as can be seen in Figure A.18, and overall redistribution benefits individuals with lower incomes.

³²In Figure A.17 we show the flip side of this result by plotting the prevalence of the different regions for each income group.

Figure 16: Redistribution across groups



NOTE: The left panel of this figure shows the share of 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 share of 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.

6 Conclusion and perspectives

This paper has tried to answer some of the most pressing questions for 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 have 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. The 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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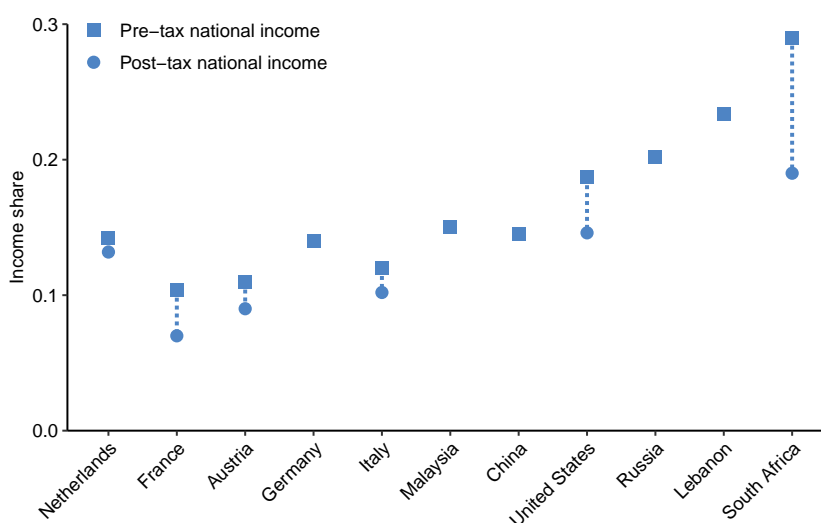
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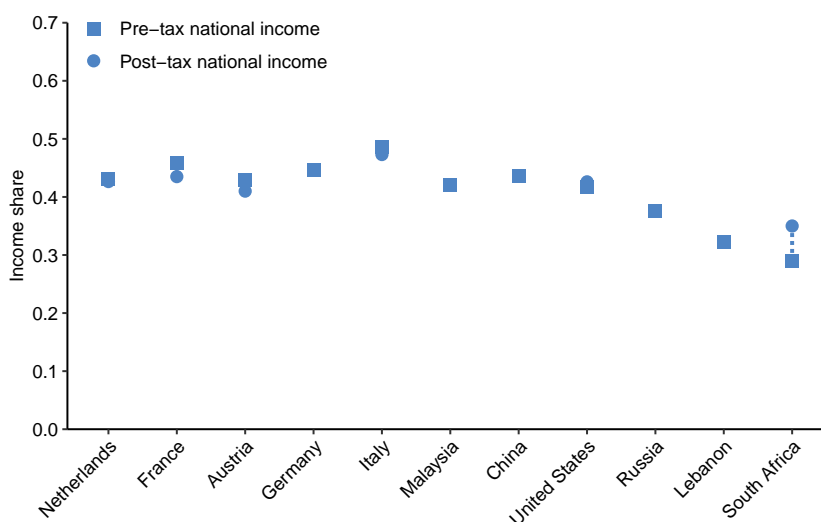
A Appendix Figures and Tables

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



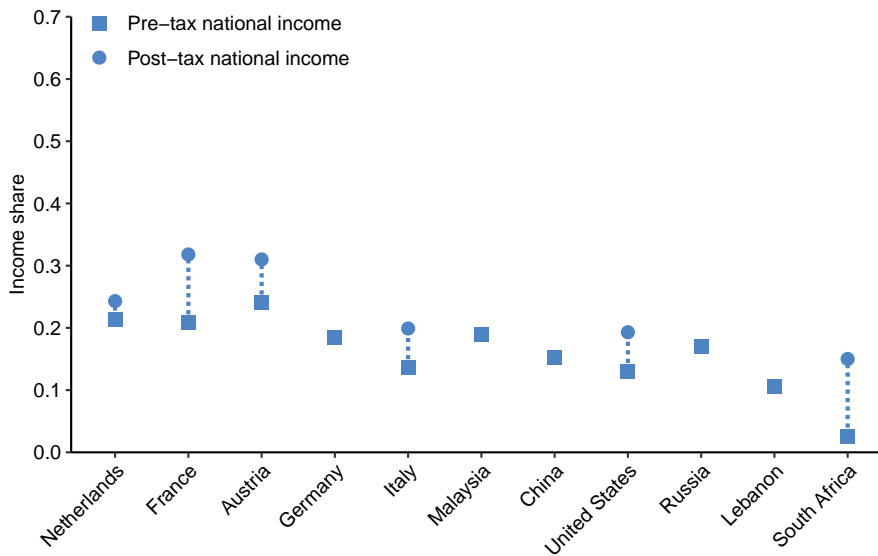
NOTE: This figure shows the share of pre-tax national income and post-tax national income accruing to the 1% income group, for a set of countries for which comparable estimates are available. We use our results for the Netherlands, Bozio et al. (2024) for France, Jestl and List (2022) for Austria, Bach, Bartels and Neef (2023) for Germany, Guzzardi et al. (Forthcoming) 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%



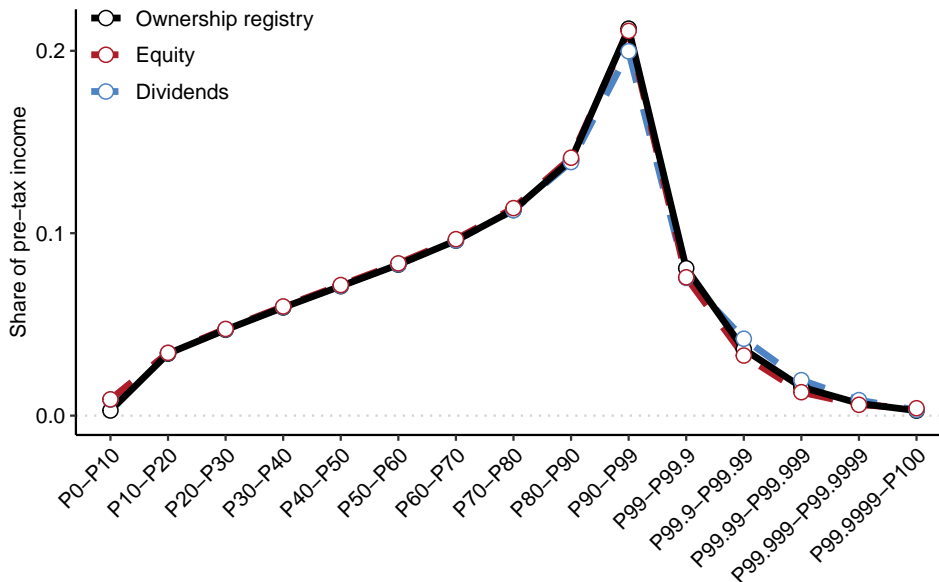
NOTE: This figure shows the share of pre-tax national income and post-tax national income accruing to the P50-P90% income group, for a set of countries for which comparable estimates are available. We use our results for the Netherlands, Bozio et al. (2024) for France, Jestl and List (2022) for Austria, Bach, Bartels and Neef (2023) for Germany, Guzzardi et al. (Forthcoming) 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%



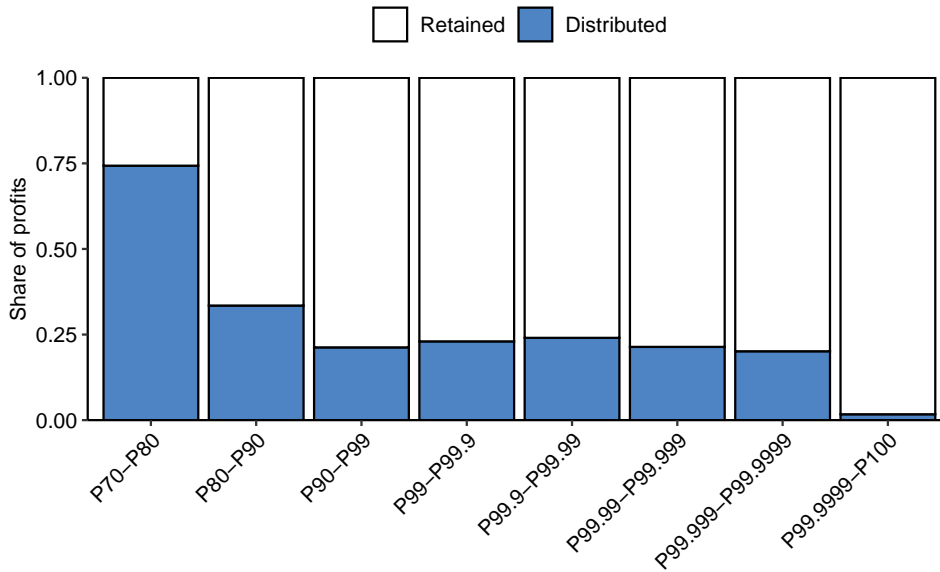
NOTE: This figure shows the share of pre-tax national income and post-tax national income accruing to the bottom 50% income group, for a set of countries for which comparable estimates are available. We use our results for the Netherlands, Bozio et al. (2024) for France, Jestl and List (2022) for Austria, Bach, Bartels and Neef (2023) for Germany, Guzzardi et al. (Forthcoming) 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 pre-tax income under different assumptions



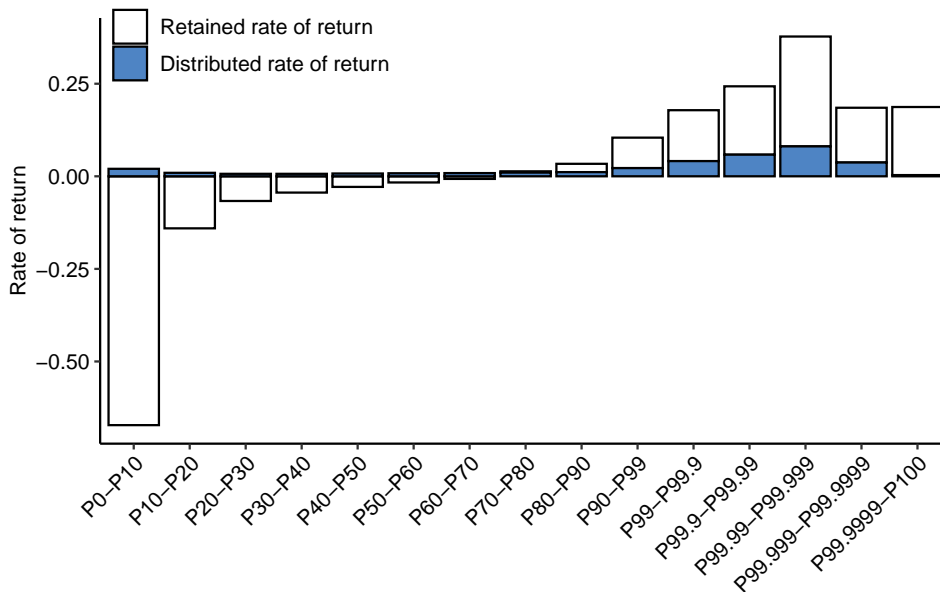
NOTE: This figure shows the share of pre-tax national income income accruing to each income group under different assumptions regarding the distribution of retained earnings. The blue line presents our main estimate using ownership registries, and the red and black lines present alternative distribution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

Figure A.5: The share of profits retained and distributed



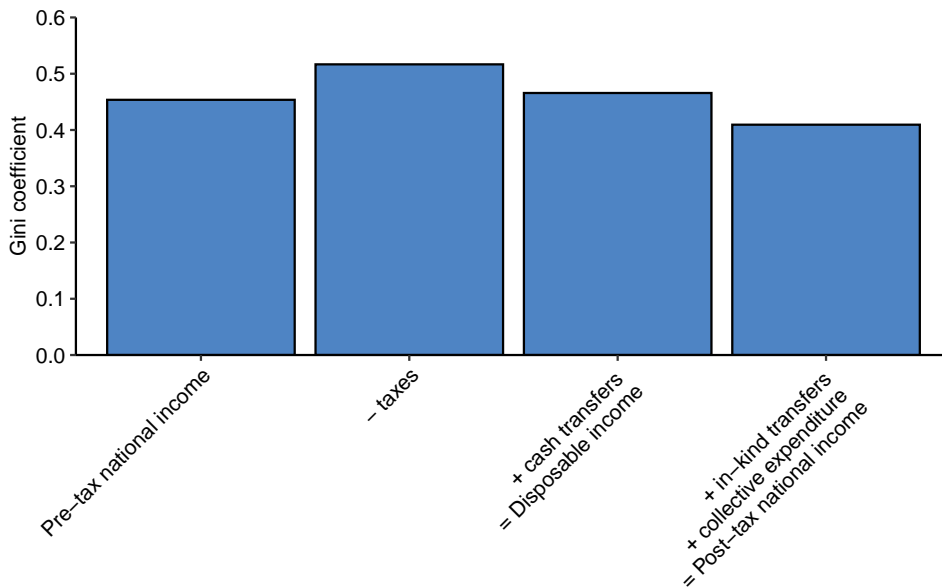
NOTE: This figure shows the share of profits of closely-held corporations that is distributed as dividends and that is retained within the firm for different income groups in 2016. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults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

Figure A.6: The rate of return on equity by income group



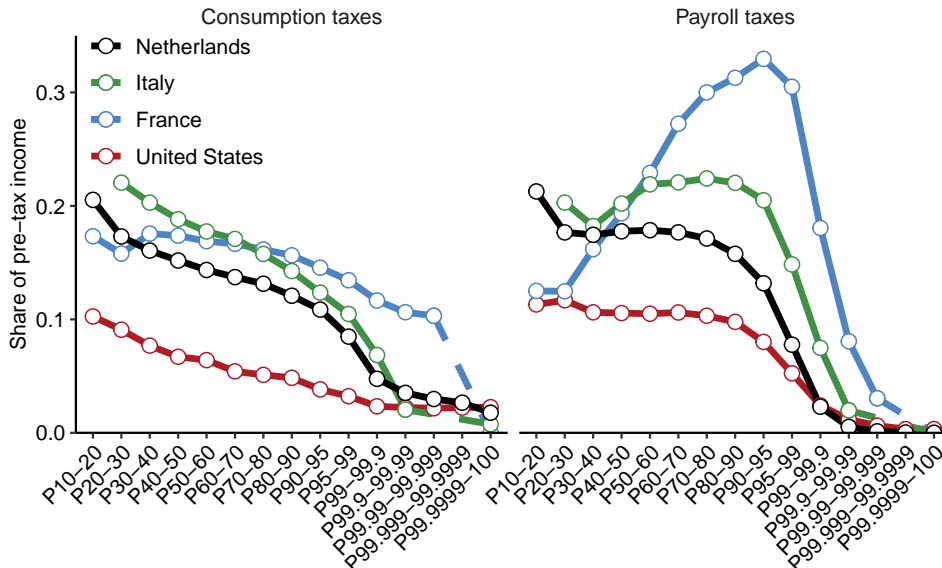
NOTE: This figure shows profits of closely-held corporations expressed as a percentage of corporate equity for different income groups in 2016. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national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

Figure A.7: Overall redistribution: The Gini coefficient for different income concepts



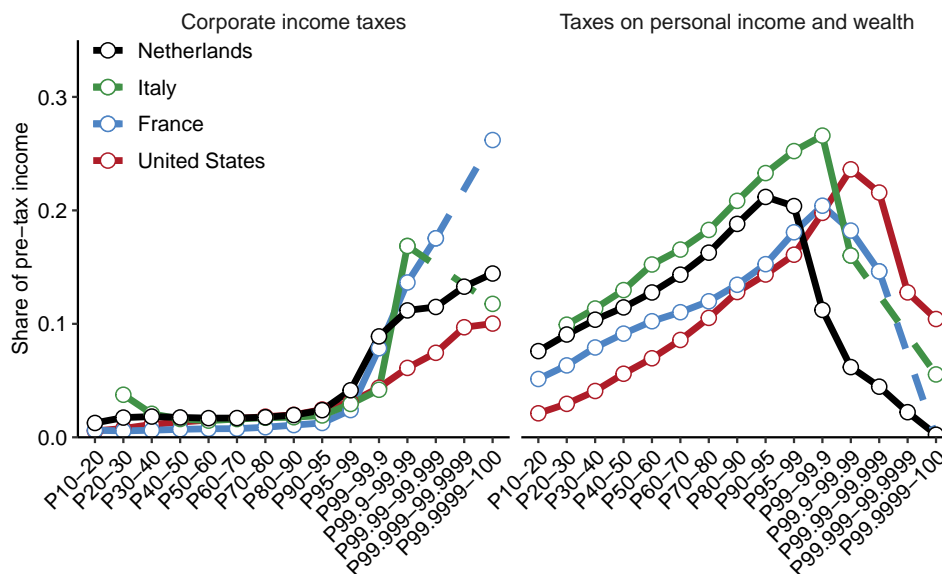
NOTE: This figure presents the Gini coefficient of income under different income concepts. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by either pre-tax national income, pre-tax national income net of taxes, disposable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

Figure A.8: The effective consumption and payroll tax rate in the Netherlands, Italy, France and the United States



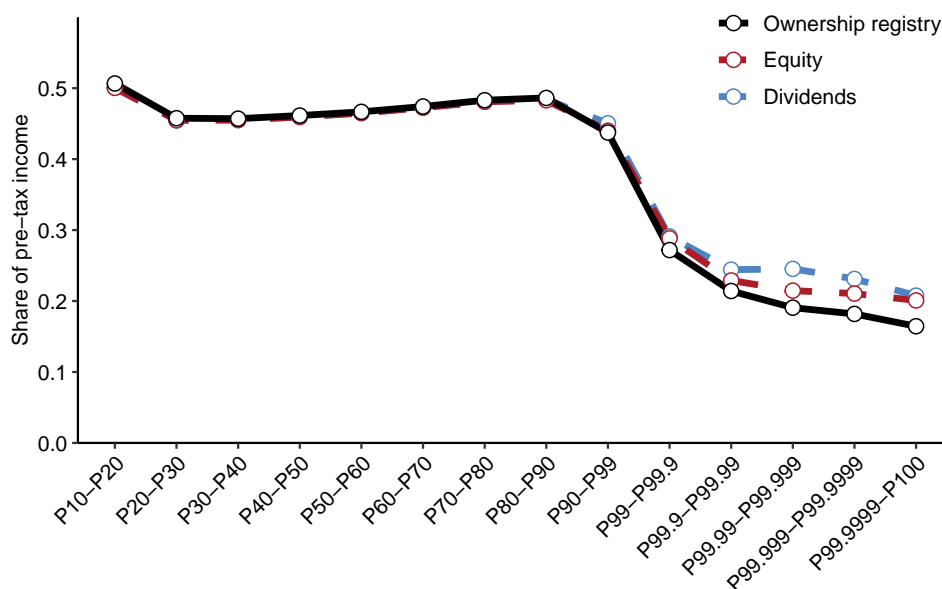
NOTE: This figure shows the effective tax rate faced by each income group in the Netherlands, Italy, France and the United States, for consumption and payroll taxes. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their 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.9: The effective corporate and personal income tax rate in the Netherlands, Italy, France and the United States



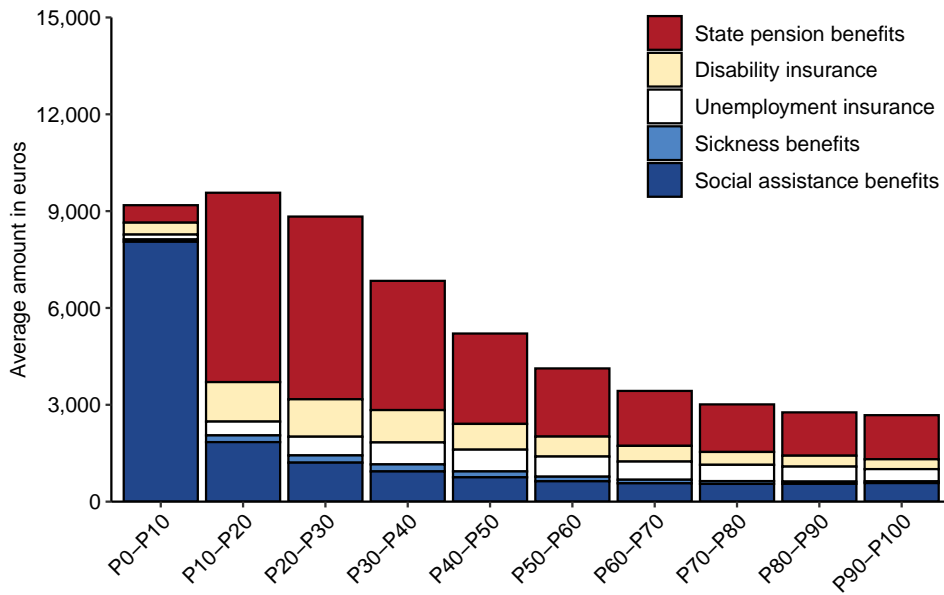
NOTE: This figure shows the effective tax rate faced by each income group in the Netherlands, Italy, France and the United States, for corporate income taxes and taxes on income and wealth. The unit of analysis is the individual adult and income is split equally among the adult members of a household.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

Figure A.10: The effective tax rate under different assumptions



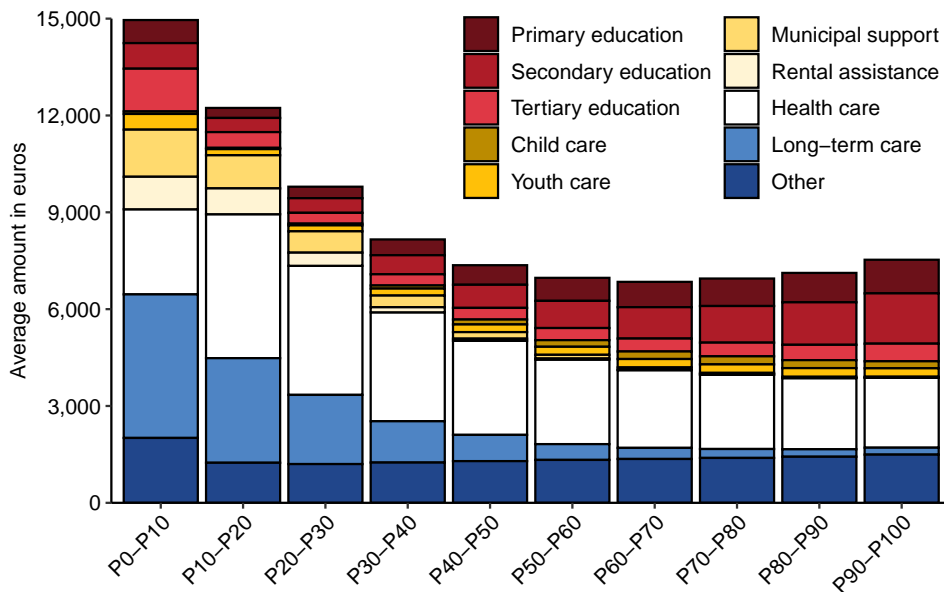
NOTE: This figure shows the effective tax rate faced by each income group in the Netherlands in 2016, under different distribution assumption regarding retained earnings. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked 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.11: The average amount of cash transfers received by each income group



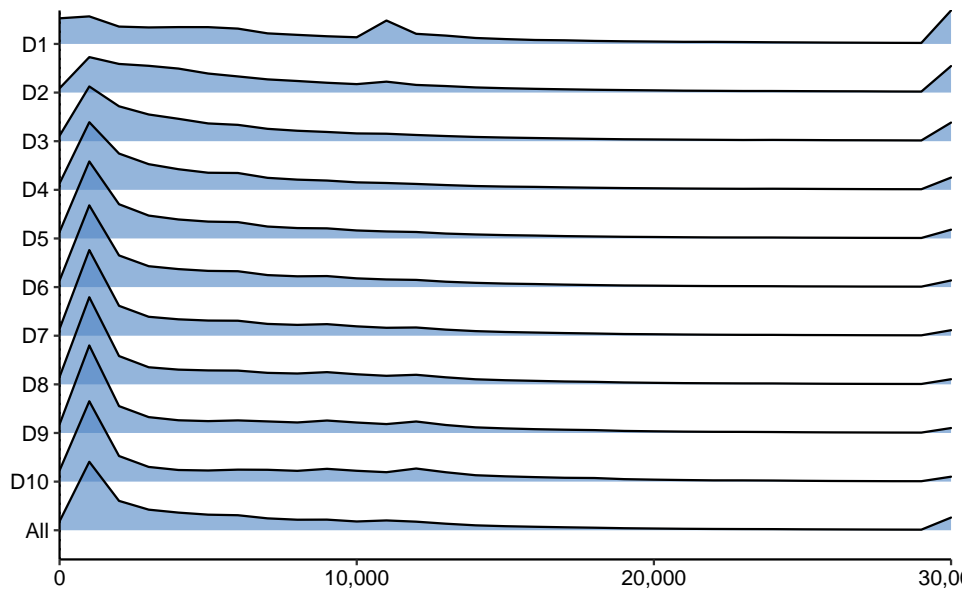
NOTE: This figure shows the amount of cash transfers received for each income group in 2016, with more detailed categories than in Figure 9. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income. Transfers are assigned to the individuals who receive them or, in the case of individuals below the age of 20, their parents.

Figure A.12: The average amount of in-kind transfers received by each income group



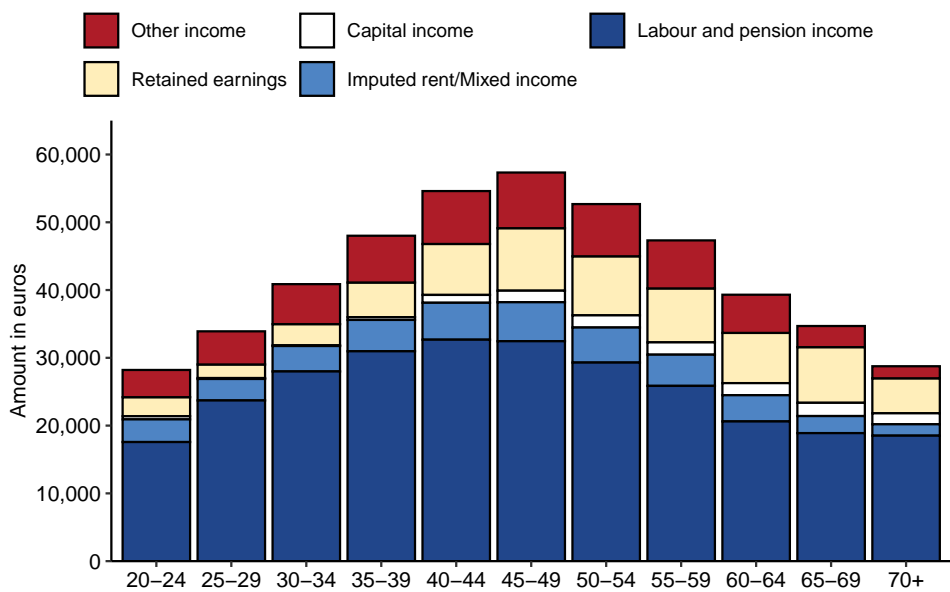
NOTE: This figure shows the amount of in-kind transfers received for each income group in 2016, with more detailed categories than in Figure 10. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national 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.13: The distribution of in-kind transfers received within each income group



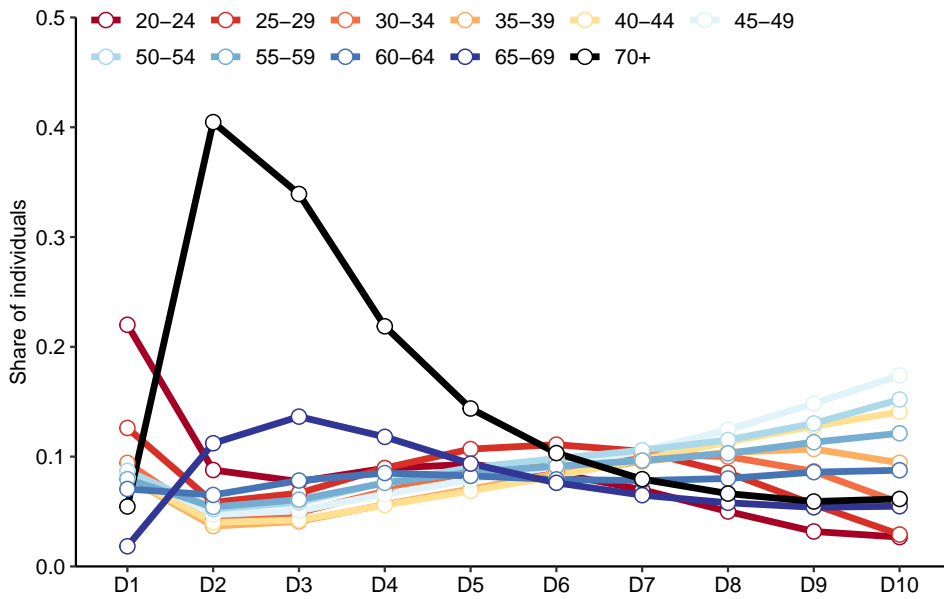
NOTE: This figure shows the distribution of in-kind transfers received by each income group in the Netherlands in 2016. The unit of analysis is the individual adult and income is split equally among the adult members of a household. Adults are ranked by their pre-tax national income.

Figure A.14: Average pre-tax national income by age



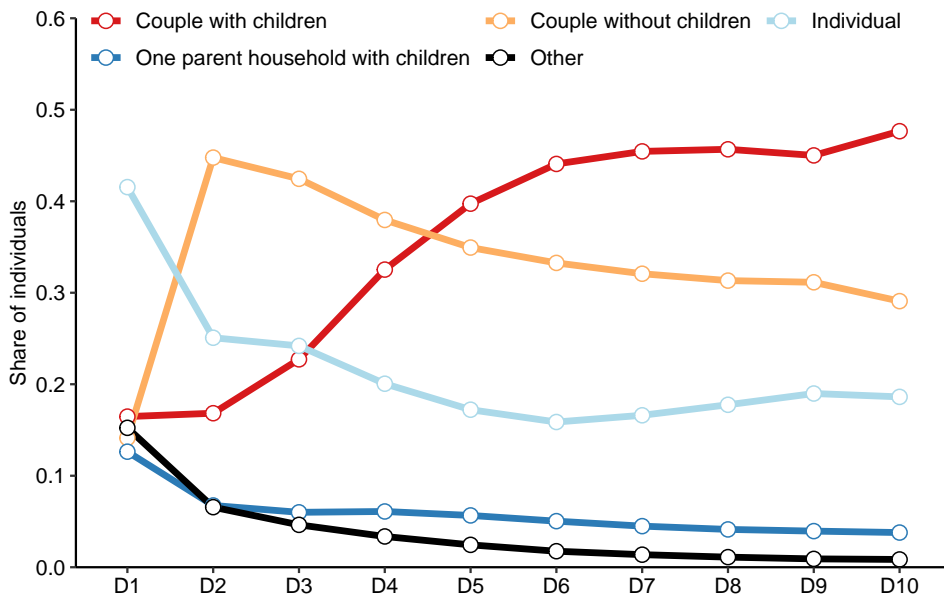
NOTE: This figure shows the average level of pre-tax national income for different age groups in 2016. The unit of analysis is the individual adult and income is split equally among the adult members of a household.

Figure A.15: Share of different age groups in each income group



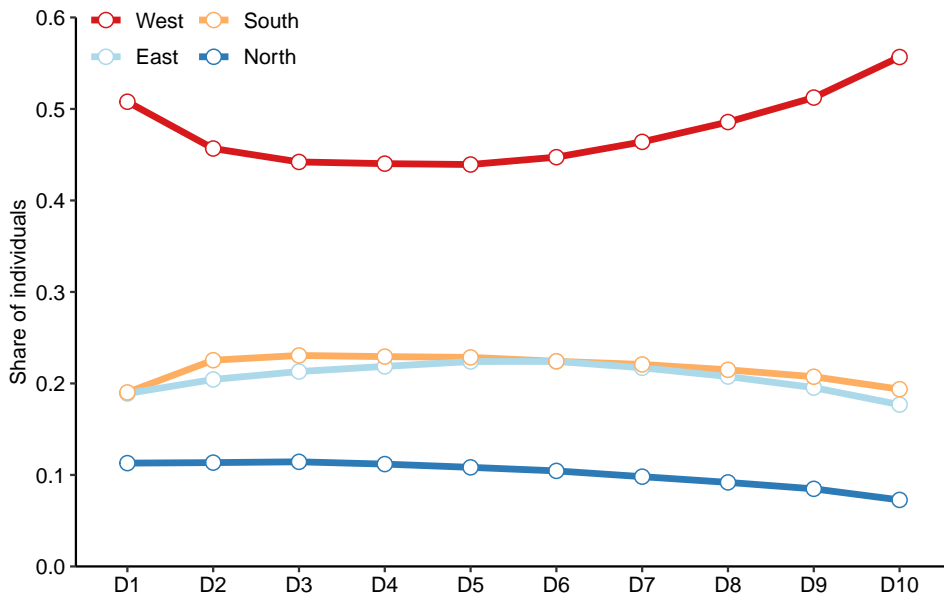
NOTE: This figure shows the share of different age groups in each income decile. The unit of analysis is the individual adult and income is split equally among the adult members of a household.

Figure A.16: Share of different household types in each income group



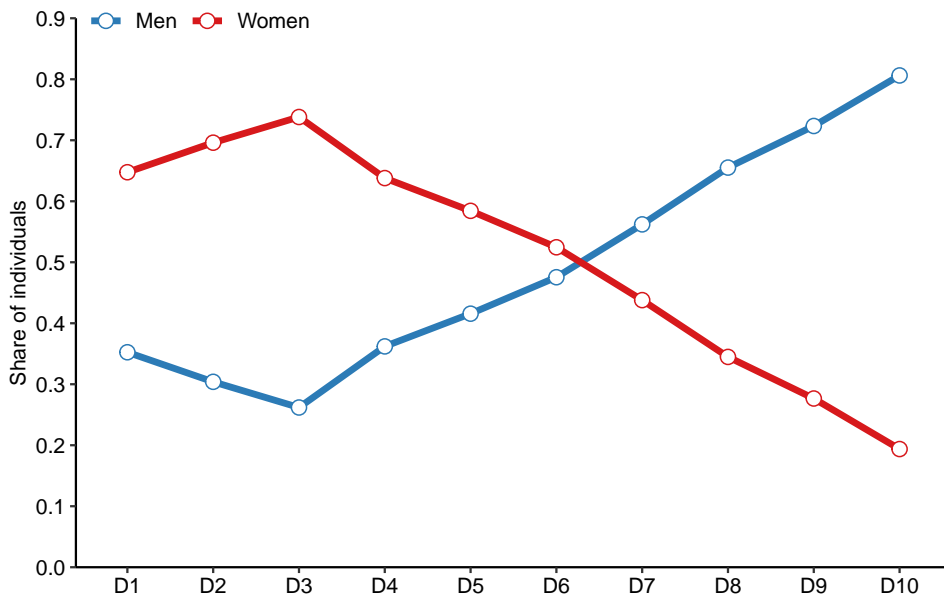
NOTE: This figure shows the share of different household types in each income decile. The unit of analysis is the individual adult and income is split equally among the adult members of a household.

Figure A.17: 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.18: 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 split equally among the adult members of a household.

Table A.1: The distribution of income in 2016

Income group	Number of adults	Pre-tax national income excluding retained earnings			Post-tax, pre-spending national income			Disposable income		
		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	100.0		€28,788	100.0		€30,355	100.0
Bottom 50%	6,666,184		€18,364	24.0		€10,271	17.8		€12,778	21.0
Middle 40%	5,332,947	€32,015	€44,723	46.8	€22,144	€31,303	43.5	€22,878	€31,931	42.1
Top 10%	1,333,237	€65,768	€111,555	29.2	€46,576	€111,310	38.7	€47,189	€111,935	36.9
Top 1%	133,324	€155,008	€326,847	8.6	€164,287	€491,488	17.1	€164,959	€492,146	16.2
Top 0.1%	13,333	€504,007	€1,198,624	3.1	€808,064	€2,200,711	7.6	€808,595	€2,201,354	7.3
Top 0.01%	1,334	€1,999,753	€4,439,832	1.2	€3,560,160	€9,122,374	3.2	€3,561,116	€9,122,982	3.0
Top 0.001%	134	€8,032,674	€14,804,603	0.4	€16,010,334	€34,317,424	1.2	€16,010,657	€34,317,988	1.1
Top 0.0001%	14	€26,515,164	€31,928,829	0.1	€77,439,402	€96,447,650	0.4	€77,439,832	€96,447,957	0.3

NOTE: This table presents statistics on the distribution of additional intermediate income concepts compared to Table 1, 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.

Online Appendix

A Institutional details

A.1 Taxation

Personal income taxes The taxation of personal income is regulated by the 2001 Income Tax Act, which categorises income into three separate “boxes”.³³ 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 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, non-owner-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). The standard rate is 21%, while the reduced rate that applies to specific product categories is 6% in 2016.³⁴ A 0% rate applies to yet another set of goods and services, partly related to cross-border transactions.³⁵ A second category of indirect taxes are excise duties, which are imposed on tobacco products, alcoholic drinks and mineral oils, such as petrol and diesel. 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 of about 0.1% of the property value. 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 under the Health Insurance Act. The general unemployment insurance contribution rate is 2.44%, while the sector-specific contribution rate is 1.78% on average. The contribution rate

³³The 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).

³⁴These product categories are listed in Table I of the 1968 Turnover Tax Act.

³⁵Product categories that face a 0% rate are listed in Table II of the 1968 Turnover Tax Act.

for disability insurance is 5.88%. These different taxes all face the same ceiling of €52,763. 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 average of €1,199. 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 and a 25% rate on profits in excess of that. 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. 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 in the case of an inheritance and €5,304 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 for general bequests and €53,016 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 is entirely exempt and only 17% of the remainder is taxable.

A.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 is allocated to long-term 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 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 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 per month. For a couple, where both have reached the retirement age, the maximum amount was €783.87 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 per month for single-person households, and €1,395.15 for couples. There are a few smaller cash transfers such as disability insurance, unemployment insurance, and sickness benefits.

B 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.³⁶

³⁶<https://www.cbs.nl/nl-nl/onze-diensten/maatwerk-en-microdata/microdata-zelf-onderzoek-doen/catalogus-microdata> (available in Dutch only).

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 (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 fiscal profit calculation 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.

C Methodological appendix

C.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 undistributed profits made 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. 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). 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 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 in corporate taxes in the Netherlands, a considerable portion of the €23 billion that firms based in the Netherlands paid as corporate taxes.

The remainder, $70.3 - 0.7 - 8 = €61.5$ billion 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.³⁷ Of this, €24.9 billion was paid out in dividends, leaving €10.6 billion 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 in gross retained earnings associated with foreign portfolio investment, €3.4 billion of which are taxes. This leaves €47.6 billion for the portion of domestic retained earnings that accrues to Dutch households. Of this, taxes account for €11.5 billion.

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. 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, of which €0.1 billion are corporate taxes.

³⁷This estimate is part of an internal update of a report on the Dutch current account (De Nederlandsche Bank, 2013).

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.³⁸ Of this, €12.7 billion was paid out in dividends and €25.4 billion 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, of which €8.1 billion are corporate taxes.

C.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.

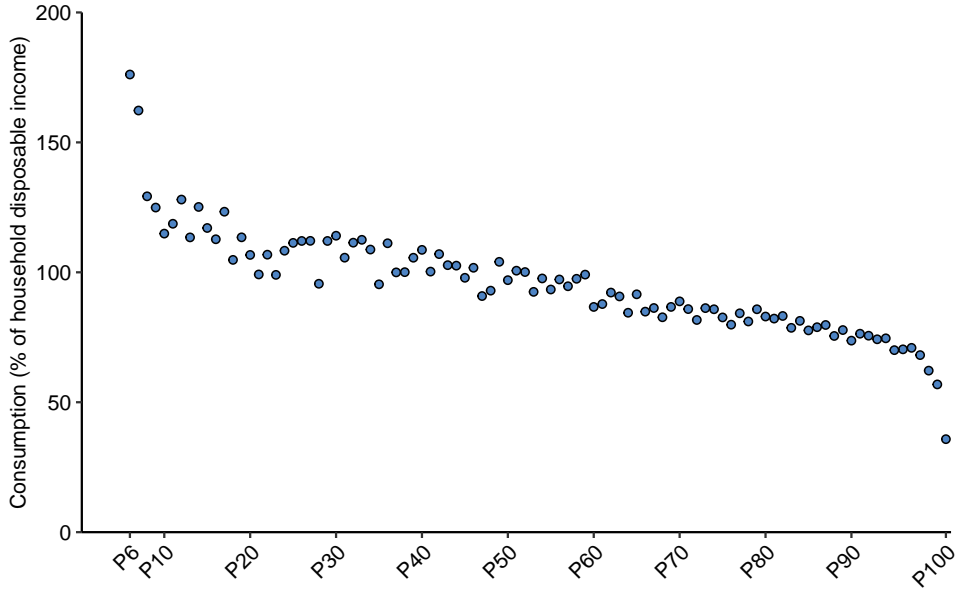
In a first stage we simulate the vat and excise taxes using the Budget Survey data (see Online Appendix B). Since excise taxes are levied per unit, we infer the quantity consumed by dividing the expenditures by the average price of the goods subject to excises. We use the unique identifier to link the 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 *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.8: 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.

³⁸This estimate is part of an internal update of a report on the Dutch current account (De Nederlandsche Bank, 2013).

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.

C.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 *Gebulztab* 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.³⁹

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.⁴⁰ The amount of social support transfers are calculated as follows. Open data⁴¹ 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 Act requires municipalities to ensure access to youth care and for granting it to young people and their parents.⁴² 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.⁴³ 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.

³⁹<https://opendata.cbs.nl/statline/#/CBS/nl/dataset/82789NED/table>

⁴⁰Only 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.

⁴¹<https://opendata.cbs.nl/#/CBS/nl/dataset/84580NED/table>

⁴²We 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.

⁴³<https://opendata.cbs.nl/#/CBS/nl/dataset/83454NED/table?ts=1630489418255>