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RESEARCH PAPER

# Simulating Long-Run Wealth Distribution and Transmission: The Role of Intergenerational Transfers

**Michele Bavaro[1] · Stefano Boscolo[2] · Simone Tedeschi[3]**

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## Abstract

This paper utilises the Italian Treasury DYnamic Microsimulation Model (T-DYMM) to project individual and household economic trends up to 2070, focusing on the intergenerational transmission of wealth inequality. To analyse the impact of intergenerational transfers on wealth inequality, various scenarios are compared to a baseline. The results suggest that net wealth inequality is expected to remain fairly stable until 2040, when it is expected to increase progressively, especially due to the rising size and inequality of intergenerational transfers. Demographic factors such as increased life expectancy and declining fertility are the main explanations for this phenomenon. Although certain assumptions, such as disregarding behavioural adjustments in response to tax changes, have their limitations, this study offers valuable insights into the potential impacts and timelines of inheritance tax reforms on long-term inequality transmission.

**Keywords** Intergenerational transfers · Inheritance · Wealth inequality · Dynamic microsimulation

**JEL Classification** D31 · H23

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✉ Michele Bavaro
michele.bavaro@spi.ox.ac.uk

Stefano Boscolo
stefano.boscolo@unimi.it

Simone Tedeschi
simone.tedeschi@unicas.it

1 Department of Social Policy and Intervention and INET, University of Oxford, Oxford, UK

2 Department of Economics, Management and Quantitative Methods, University of Milan, Milan, Italy

3 Department of Economics and Law, University of Cassino and Southern Lazio, Cassino, Italy

## 1 Introduction

The ratios of wealth to income are rising all over the world (Piketty and Zucman 2014). The growing role of wealth has been paralleled by the increase in wealth inequality, which remains steady and consistent in Western countries (Cannari and D'Alessio 2018). As a component of wealth, intergenerational transfers (IGTs), in the form of inheritances and gifts, have been increasing their weight on total private wealth over the last few decades (Alvaredo et al. 2017; Acciari et al. 2024), a phenomenon that Atkinson (2018) defined as 'the return of inheritance'.

These trends have revived an interest in the distribution of wealth and IGTs as a source of inequality persistence and transmission mechanism (Nekoei and Seim 2022). From a generational perspective, IGTs may reduce inequality between cohorts but may conversely exacerbate economic disparities within cohorts. In either way, they are an important (in)equality transmission channel. The literature analysing the role of IGTs in shaping wealth inequality has reached more solid conclusions on the limited but non-negligible magnitude of the effect rather than its sign. See, for instance, the contributions by Wolff and Gittleman (2014) and Palomino et al. (2021), for a comparison of different results in terms of sign, inequality-decreasing the first and inequality-increasing the second.

Differently from this strand of literature, we focus on a forward-looking approach and investigate the long-term relationship between IGTs and wealth using dynamic microsimulation models (DMMs). In the field of economics, microsimulation models are simulation tools based on micro units of data such as individuals, households or firms. They are conventionally used to study the impact of changes in tax-benefit policies and/or changes in the behaviour of economic agents (Dekkers 2015). Unlike macroeconomic models, individual heterogeneity is entirely preserved and modelled. In the field of microsimulation, DMMs are characterised by their ability to simulate the behaviours of agents over time, updating the sample over each period. Starting from observed distributions and external projections on macroeconomic and demographic developments, We employ dynamic microsimulation techniques to project the long-term pattern of wealth inequality, assuming that accumulation and transfer behaviours remain largely unchanged within the current institutional framework and across alternative scenarios. DMMs seem particularly suited for studying IGT-related outcomes, given the full modelling of the demographic processes that underpin the transmission of wealth. The number of heirs and how they are allocated across the wealth distribution are key factors in determining the extent to which intergenerational wealth transfers influence wealth redistribution (e.g. if all households have only one heir, the inequality in the wealth transmitted by parents would equal the inequality in the wealth received by heirs).

Italy constitutes an interesting case study because its economy has precise peculiarities. It has one of the highest wealth-to-income ratio (WIR) among rich countries (ISTAT and Bank of Italy 2024), which has seen a considerable increase in recent decades, primarily due to the surging role of finance in the Italian economy.[1] Further-

[1] Financial assets accounted for 1.3% of the Italian national income in 1980 while accounting for 3.8% in 2017, as opposed to house wealth, which rose from 3.5% in 1980 to 4.6% in 2017 (Caprara et al. 2018).

more, Italy has one of the lowest projected fertility rates in the EU and a population that will further shrink in the coming years, according to official statistics (EU Commission 2021; ISTAT 2022). Finally, the ratio between IGTs and national income increased from 8.5% in 1995 to 15.2% in 2016 (Acciari and Morelli 2020) and, according to OECD (2021), tax revenue related to IGTs are rather low in absolute terms and form a very small share of total tax revenue (0.1%), well below the OECD average (0.36%).

This paper aims to shed light on the likely future evolution of wealth inequality in Italy and the peculiar role of IGTs in this specific respect. The analysis is based on the recent release of the last version of the Italian Treasury DYnamic Microsimulation Model (T-DYMM), a DMM owned by the Department of Treasury (DT) of the Italian Ministry of Economy and Finance (MEF), by Conti et al. (2024). The model stands out for the comprehensiveness of the simulated processes and events compared to the DMMs currently operating for Italy (Maitino et al. 2020; Bronka and Richiardi 2022), in particular for the inclusion of a module for the modelling of wealth accumulation and transmission mechanisms. The starting dataset at the basis of T-DYMM's simulations is derived by linking survey data with a vast richness of administrative information at the individual and household levels. We provide a thorough description of the complex data cleaning and ordering processes that led to the baseline wealth distribution. We stress the importance of such an exercise in the context of limited access to high-quality wealth data.

To our knowledge, no research has yet explored the long-term relationship between IGTs and wealth inequality in a dynamic microsimulation setting. In particular, we compare T-DYMM's baseline scenario with different counterfactuals that help disentangling the effect of IGTs on wealth inequality. We also draw initial considerations on the role of the inheritance and gifts tax by focusing on the first-order inequality and budgetary effects of a policy switch to the French-style tax in the Italian context.

The remainder of the paper is structured as follows. In Sect. 2 we propose a review of related studies. Section 3 describes the steps taken in the construction of the wealth dataset that serves as the basis for our simulations. Section 4 briefly sketches the structure of T-DYMM and goes into detail about the structure of the wealth module. Section 5 presents the simulation results. Section 6 offers concluding remarks.

## 2 Literature Review

Following the empirical results put forward by Piketty (2011) and subsequent papers regarding the return of inheritances, there has been a recent wave of research analysing the relationship between intergenerational transfers and wealth inequality. Wolff and Gittleman (2014) and Bonke et al. (2017) rely on the recall capacity of respondents to distinguish between inherited and non-inherited wealth. These studies point to an equalising effect of IGTs on wealth inequality for the US and EU, respectively. Similarly, Boserup et al. (2016) and Elinder et al. (2018) conclude that inheritances contribute to the reduction of wealth inequality in relative terms at the cost of an increase in absolute dispersion. The opposite view is suggested by the works of Fessler and Schürz (2018) and Palomino et al. (2021). In the first paper, the authors found that in European countries IGTs strongly determine the position in the wealth distribution, using decomposition regression analysis. In contrast, by constructing counterfactual distributions, the latter study pointed out that IGTs explain around 30% of wealth inequality in four major OECD countries. See also the works by Nolan et al. (2021) and Morelli et al. (2021) for analogous findings. A similar approach to the one employed in Palomino et al. (2021)'s work is adopted by Feiveson and Sabelhaus (2018), who compare the observed wealth distribution in the US with one in which the wealth attributable to IGTs is distributed equally across the population. In doing so, they show that the wealth share of the top 10% of US households would fall from 73 to 57%.

The recent contribution of Nekoei and Seim (2022) constitutes a remarkable step forward, since it derives a theoretical framework to understand the relationship between IGTs and wealth inequality. By focusing on depletion rates, they suggest that IGTs have a higher impact on wealth inequality when intergenerational mobility is low, inheritances are unequally distributed, and pre-inheritance wealth inequality is also high.

One closely related topic refers to the role of inheritance (or transfer) taxes in addressing wealth inequality attributable to IGTs.

Regarding Italy, Jappelli et al. (2014) estimate that abolishing transfer taxes would rise the probability of making real-estate transfers for rich donors as opposed to poorer ones. Krenek et al. (2022) developed INTAXMOD, a model that can simulate wealth transfers and inheritance tax revenue up to 2050 for a selection of European countries. The authors estimate that inheritance tax revenue in Italy will double by 2040, before France and Germany, which will reach this mark by 2050. Our study complements these results by fully exploiting the potentialities of DMMs in terms of sample representativeness and distributive analysis.

## 3 Data Sources and Baseline Sample

This section begins by outlining the data sources used for constructing the baseline sample in T-DYMM, followed by a detailed discussion of the wealth dataset employed in the simulation.

The dataset used for this paper, referred to as AD-SILC, is built by linking the Italian component of the European Union Survey on Income and Living Conditions (IT-SILC) with administrative data on individual contribution histories from the Italian Institute of Social Security (*Istituto Nazionale della Previdenza Sociale*, INPS) archives and with tax return data for 2015 from the Italian Department of Finance (DF) of MEF. The merging procedures across different data sources are conducted by exact matching of individual tax codes (*codici fiscali*).[2]

The most complete version of AD-SILC includes the IT-SILC waves from 2004 to 2017. For all the individuals in these waves, we have information on their working career and public pensions, as well as tax records for selected years. The baseline sample of T-DYMM is based on IT-SILC for 2016. The sample includes 48,316 indi-

[2] The merging is conducted by the statistical organism at MEF. Anonymity and confidentiality are preserved in the process.

**Table 1** Microdata sources in T-DYMM: AD-SILC database description

| Variable | Origin | Link |
|---|---|---|
| Working career | Administrative (INPS) | Exact |
| Income | Administrative (INPS/DF) | Exact |
| Sociodemographic variables | Survey (IT-SILC) | Exact |
| House wealth | Administrative (DF) | Exact |
| Financial wealth | Survey (SHIW) | Statistical |
| Liabilities | Survey (SHIW) | Statistical |

viduals for a total of 21,325 households. We calibrate the original IT-SILC sample weights following Deville and Särndal (1992)'s raking procedure to improve the representativeness of sociodemographic characteristics and gross income distributions referring to the end of the 2015 year. To allow for the use of alignment procedures within the model (Dekkers and Cumpston 2012), we expand the sample by duplicating individuals on the basis of newly calibrated weights. We draw with replacement 100 samples of 100,000 households and select the one that best fits the external totals used in the calibration procedure. As a result, the base year dataset comprises 238,431 individuals.

The micro-database adopted in the paper is equipped with information on several socioeconomic and monetary indicators, whose data sources are summarised in Table 1. Administrative records provide information on working careers and income, while survey data cover sociodemographic characteristics. The wealth information also has a mixed origin, and we devote the rest of this section to describing in detail the wealth database. For further information on the baseline dataset other than wealth data, we refer the reader to Conti et al. (2024).

### 3.1 Constructing a Reliable Wealth Dataset for Italy

Information on house wealth is derived from DF archives, which are linked by exact matching at the individual level with the 2016 IT-SILC sample. DF archives encompass tax return and cadastral data. Among cadastral records, which contain information on real estate owned,[3] we are provided with the market value of residential dwelling units according to the Italian Observatory of the Real Estate Market (*Osservatorio del Mercato Immobiliare*, OMI). This information enables the adjustment of real estate values, aligning the cadastral values reported for tax purposes with market prices, while accurately reflecting territorial price variations. In Appendix A.1, we compare AD-SILC house wealth data with statistics from National Accounts (NA) provided by the Bank of Italy for the year 2015.

For financial wealth and liabilities, we employed a different data strategy. We used the Survey on Household Income and Wealth (SHIW) held by the Bank of Italy,

[3] The available variables are the following: municipality where the real estate unit is located; cadastral category; cadastral value; surface in square meters; share of possession. The cadastral category is the key information to distinguish between residential and non-residential units.

**Table 2** Wealth dataset totals (€ billion), 2015

| | AD-SILC | NA | Ratio |
|---|---|---|---|
| House wealth | 5020.3 | 5333.3 | 0.941 |
| Financial wealth | 2534.6 | 3146.9 | 0.805 |
| Liabilities | 340.3 | 692.1 | 0.492 |
| Net wealth | 7214.6 | 7788.1 | 0.926 |

The table shows the comparison between the weighted wealth totals from AD-SILC and those from the National Accounts. Financial wealth is the sum of liquidity, government bonds, corporate bonds and stocks. Source: Authors' elaborations on AD-SILC (2015)

matched to AD-SILC data through statistical matching. In this procedure, AD-SILC is the *recipient* sample and SHIW the *donor* of missing information on financial assets and liabilities. We adopted a propensity score matching technique (Rosenbaum and Rubin 1983). A preliminary step has been taken to correct SHIW data on financial wealth and liabilities for under-reporting in ownership and total amounts, since, as is well known in the literature (Bonci et al. 2005), survey data are plagued by this source of measurement error. The complete explanation of the procedure implemented is available in Appendices A.2 and A.3.

Finally, in Table 2 we summarise the data construction process by comparing the wealth totals of our dataset (AD-SILC) with the NA. In terms of net wealth, our measure constitutes about 93% of the net wealth of the NA. House wealth, primarily sourced from administrative data, provides the greatest precision with a coverage of 94% of the NA. On the contrary, the financial wealth and liabilities, although we have adopted the correction for the under-reporting, are well below than the national totals. In Appendix A.4, we integrate the comparison between our results and external sources, such as the Distributional Wealth Accounts (DWA) developed by the European Central Bank, which allow for a more comprehensive validation including distributional patterns.

## 4 Modelling Wealth and Intergenerational Transfers with a Dynamic Microsimulation Model

This section outlines the current structure of the baseline version of T-DYMM with a focus on how wealth evolves within the model. For an in-depth description of how T-DYMM works, we refer the reader to Conti et al. (2024). In what follows, we provide a summary of the main characteristics of the model.

### 4.1 How does T-DYMM Work?

The model is organised into five modules: demographic, labour market, pension, wealth, and tax-benefit. We sketch the modular structure in Fig. 1. While the model operates sequentially through its modules, interactions between modules are also accounted for.

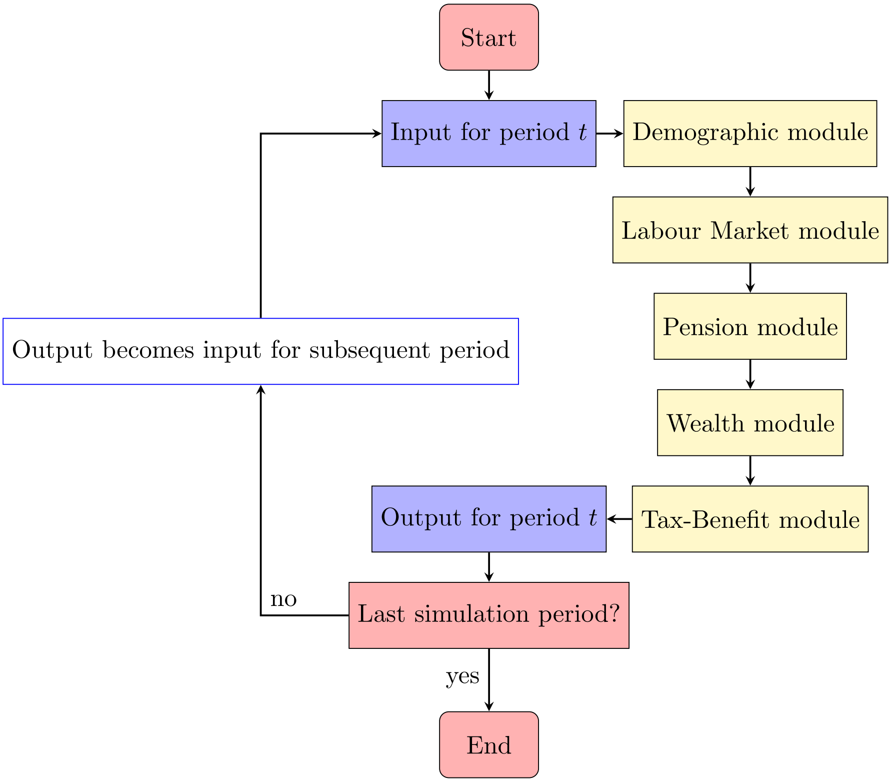


**Fig. 1** Modular structure of T-DYMM

The starting sample is set in 2015 and simulations run on an annual basis from 2016 until 2070, aligning with the projection horizon of the 2021 Ageing Report by the European Commission. The model includes the simulation of demographic events (e.g. birth, educational attainment, marriage, death), main labour market outcomes (occupational status and earnings) and pension incomes at the individual level, consumption, savings, and wealth transmission at the household level, as well as taxes paid and social transfers granted at the national level. In each module, individual and household choices are modelled using estimates from microdata regressions based on AD-SILC and aligned to institutional projections.

Alignment contributes to the long-term stability of model outputs, for instance, by keeping employment levels in line with official projections. It also defines the macroeconomic trajectory of the modelled economy, for example, by determining how wages evolve over time.[4]

In Table 3 we present the main alignment parameters, with information on the data sources and the trends in the simulation period. In the period between 2016 and 2021 we use official historical statistics for the alignments. From 2022 to 2070 the alignments follow demographic and macroeconomic assumptions.

[4] In the baseline scenario wages grow with labour productivity and inflation as standard in economic theory.

**Table 3** Demographic and macroeconomic alignments: baseline scenario

| | | 2019 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|
| Demographic | Life expectancy at 65 | 21.3 | 22.2 | 23.1 | 24.0 | 24.8 | 25.6 |
| | Total fertility rate | 1.3 | 1.4 | 1.4 | 1.4 | 1.5 | 1.5 |
| | Net migration flow (thousands) | 134.7 | 224.0 | 217.2 | 214.3 | 210.5 | 206.6 |
| | Total population (millions) | 60.3 | 59.9 | 59.3 | 58.0 | 55.9 | 53.9 |
| Macroeconomic | Real GDP | 0.5 | 0.4 | 1.1 | 1.5 | 1.4 | 1.3 |
| | Labour productivity | 0.0 | 0.7 | 1.7 | 1.7 | 1.6 | 1.5 |
| | Inflation | 0.5 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| | Employment rate | 63.6 | 66.3 | 68.2 | 69.4 | 69.4 | 69.8 |
| | Avg. propensity to save | 8.0 | 7.8 | 7.6 | 7.5 | 7.4 | 7.4 |

Employment rates refer to individuals aged between 20 and 64 years old. *Source*: Eurostat, European Commission, ISTAT

The demographic and macroeconomic framework is aligned with official statistics from the European Commission for the period 2016–2021. From 2022 onward, it follows the baseline scenario outlined in the 2021 Ageing Report. An exception is the saving rate, which is linked to ISTAT data in the 2016–2021 period and to official macro assumptions thereafter. The demographic assumptions highlight the secular increase in life expectancy and the positive net migration flow, both well-documented trends in Italy's evolving society. The same holds true for the low fertility rate, which, coupled with the expected passing of a large portion of the so-called baby boomer generation, is projected to result in a significant decline in the overall population. The baseline macroeconomic assumptions depict a flat trend in the main economic variables such as GDP, productivity, inflation, and the saving rate, with the exception of 2020, an outlier year due to the pandemic. Additionally, the employment rate experienced an increase, driven by a higher propensity for women to enter the workforce.

### 4.2 How Wealth Evolves Over Time?

Moving to a detailed description of wealth accumulation processes, we first provide key definitions. Net wealth is defined as the sum of real and financial wealth net of liabilities. House ownership is the only form of real wealth in our model and mortgages are the only source of liabilities. Financial wealth is divided into four types of assets: liquidity, government bonds, corporate bonds, and stocks.

The Wealth module, by interacting with the other modules, shapes the evolution of household net wealth. The module structure is illustrated in Fig. 2. It is composed of different sequential processes, as presented from the top to the bottom in the flow-chart.

The starting processes involve intergenerational transfers, specifically *inter vivos* (gifts) and *mortis causa* (inheritances). The second process updates the amount of annual wealth. Household savings and the severance pay are summed up to existing financial accrues, and house wealth and financial wealth evolve over time depending on nominal rates of returns. These rates vary depending on the type of financial

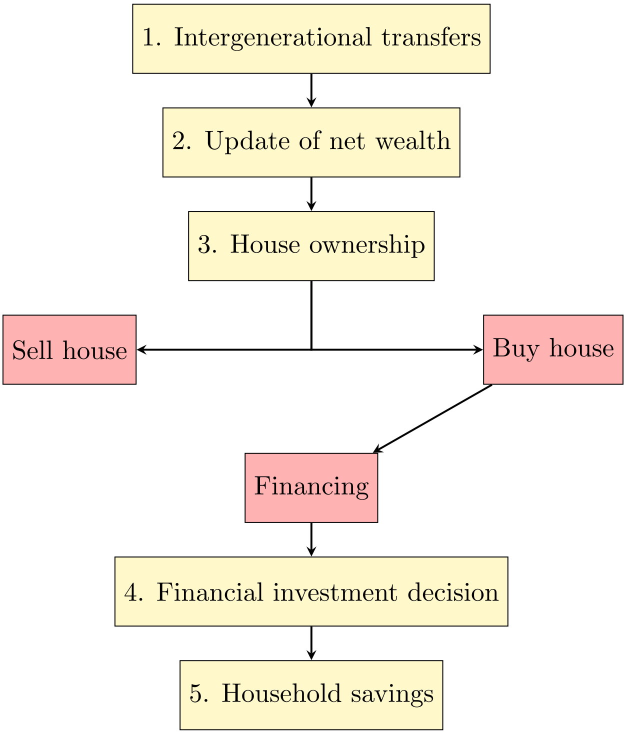


**Fig. 2** Structure of the Wealth module. If individuals do not sell or buy a house, they move to financial investment decisions and subsequent processes

investment decision, including the opportunity to invest in house wealth and generate income through rentals. Subsequently, every household is assigned a probability of buying and selling house properties, both main residence and other houses.[5] The financial investment decision process allocates financial wealth across four components: liquidity, government bonds, corporate bonds and stocks. Finally, the last process in the Wealth module is the household consumption decision. At the end of each year, every household is endowed with an amount of disposable income. The model determines a level of consumption that may equal, fall below, or exceed the household's disposable income. If consumption surpasses income, the household draws on its financial wealth to cover the excess expenses. Conversely, if consumption is lower than income, the household generates savings.

Every step of the Wealth module involves choices made at the household level that are modelled through regressions and alignments. The estimates adopted in the model are based on the SHIW microdata (waves 2002–2016). We use discrete choice models (logit) for discrete transitions (for instance, buying/selling houses, making/receiving intergenerational transfers, renting second dwellings) and continuous regressions for quantities (either log levels or ratios of income or financial wealth). In Appendix

[5] Every year of simulation, the number of houses bought equals the number of houses sold. In addition, the total value of houses bought equals the total value of houses sold.

D we provide the complete list of regressions. The general criteria that guided the selection of the explanatory variables in the estimates are the economic relevance of the variables with respect to the dependent variable, the capacity to project the explanatory variables over the simulation period, and the significance of the estimated coefficients. In addition, we have been careful to avoid obvious endogeneity problems. The criteria did not have hierarchical order but were combined to obtain the most reasonable result in an economic and econometric sense.

Given that the processes of acquisition/selling of houses as well as financial investment do not imply any change in the total value of wealth in the economy, we can summarise the process of wealth accumulation in our model with the following equation.

$$\Delta W_t = r_{t-1} W_{t-1} + S_{t-1} + IGT_{t-1} + R_{t-1}.$$

The dynamics of wealth depends on a limited number of factors, namely the level of savings ($S_{t-1}$), the overall return on wealth ($r_{t-1}$), and the intergenerational transfers ($IGT_{t-1}$), with a residual role played by the severance pay ($R_{t-1}$).

The nominal returns on wealth are summarised in Table 4, distinguishing between sources of wealth: housing and financial assets, the latter further divided into government bonds, corporate bonds, and stocks. Liquidity is excluded as it does not provide any nominal returns. Additionally, returns are categorised into income and capital gains: the former reflect capital income, while the latter represent nominal changes in the value of wealth over time. The absence of capital gain for house wealth and government bonds is assumed, their real return in terms of capital gain is zero, but their values evolve year after year according to the inflation rate. In fact, while house wealth, government bonds, corporate bonds, and stocks generate capital income, only corporate bonds and stocks contribute to changes in net wealth. The projected returns follow historical trends until 2021 while macro and statistical assumptions from 2022 to 2070. The capital gain on corporate bonds is aligned to S&P 500 until 2021 and follows projections based on long-run S&P 500 trends afterwards. For stocks, the trajectory is similar, but with a higher expected return compared to bonds in the long run. The nominal returns, as shown in Table 4, follow a stable and positive path during the simulation period.[6]

The level of household savings depends crucially on the savings rate that is computed by difference with the consumption decision and aligned to an average propensity to save. The average savings rate decreases in the simulation time span, following a historical trend.[7] Still, the propensity to save depends on household characteristics, such as the level of household income, financial wealth, the number of components and income earners, as well as the age and retirement status of the household head. We estimate a consumption equation based on panel regression using SHIW data for the period 2002–2016.[8] The regression coefficients illustrate a positive correlation

[6] The returns inserted in the baseline version of the model do not incorporate any heterogeneity at the household level.

[7] According to ISTAT figures, the savings rate in Italy has been more than halved between 1995 and 2019, passing from 20.8 to 9.6%.

[8] We adopt a fixed effects estimator, and the estimated correlation between the vector of explanatory variables and the unobserved time-invariant residual is included in the simulation.

**Table 4** Projected rate of nominal returns adopted in the Wealth module

| | Gain | 2016–2021 | 2022–2070 | 2019 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|---|---|
| House wealth | Income | OMI | Projections based on OMI | 3.4 | 2.1 | 2.6 | 3.1 | 3.3 | 3.4 |
| Govt. bonds | Income | Implicit rate of return on public debt, DT (MEF) | Implicit rate of return on public debt, EU Commission | 2.0 | 0.3 | 0.8 | 1.4 | 1.6 | 1.7 |
| Corp. bonds | Income | S&P 500 | Implicit rate of return on public debt, EU Commission | 2.6 | 0.3 | 0.8 | 1.4 | 1.6 | 1.7 |
| | Capital | S&P 500 | Projections based on S&P 500 | 5.1 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| Stocks | Income | S&P 500 | Implicit rate of return on public debt, EU Commission | 2.1 | 0.3 | 0.8 | 1.4 | 1.6 | 1.7 |
| | Capital | S&P 500 | Mark-up stocks–bonds | 9.5 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 |

between household income and financial wealth and consumption, as expected. The number of household components and of income earners augment the total consumption level, whereas the retired status of the head of the household reduces consumption and, therefore, increases savings. However, regression estimates highlight an issue related to the difference between microdata and macro aggregates on consumption and savings rate. As is known in the literature (Cifaldi and Neri 2013), there is a discrepancy between the savings rate obtained from SHIW data and the one obtained from National Accounts. Subsequently, we choose to align the average level of consumption with the national savings rate. In other words, the aggregate savings rate is exogenous to the model, while it is endogenous at the household level. For the initial years of the simulation, we use actual data from ISTAT, while the projection is carried out using a logarithmic function (reverting to its long-term trend, the savings rate decreases to 7.0% by 2070).

Assuming that severance pay is a minor form of wealth accumulation since it occurs *una tantum*, the sources we have covered so far may be considered as more stable drivers of wealth accumulation, due to their alignments. The remainder of this section is dedicated to discussing the final channel of wealth accumulation: intergenerational transfers.

### 4.3 The Role of Intergenerational Transfers in Wealth Accumulation

In the remaining part of the section we elaborate on the intergenerational factor by describing its modelling within the Wealth module of T-DYMM and the interactions with the rest of the processes. Intergenerational transfers are categorised into two types: inheritances and gifts, each modelled separately to capture their distinct dynamics. In general, the inheritance process is driven by demography as the total amount of annual inherited wealth equals the wealth of individuals who pass away in each simulated year. Hence, from the donor side the strategy is straightforward: individuals who pass away become the donors of inherited wealth. The probability of death is aligned to Eurostat projections divided by sex and age.

On the receiver side, we start by assuming that wealth may be transferred only to spouses and offspring, excluding other relatives. The split between strict relatives is assumed to follow rules established by Italian law.[9] The portion of household wealth (divided into its components) that goes to the spouse, when there are no other heirs, is equal to 50%, since we assume equal sharing of wealth between partners. In the presence of one child as an additional heir, the spouse will receive the first half of the disposable wealth, while the other heir receives the second half; for additional children, the rule provides 1/3 to the spouse a 2/3 equally shared to the children. To attribute inherited wealth, an in-sample link between the heirs and the deceased is necessary. The link is easily made for partners who live in the same household among which one of the two dies and the other inherits the household wealth, but this is not the case for children, who may be out of the household at the death of one of the

[9] The case of last will is excluded for the sake of simplifying the model structure. According to the latest official statistics from ISTAT, the share of last wills over the total number of deaths in Italy is stable over time and around 12% in 2022.

parents. We chose a mixed strategy for finding heirs in T-DYMM. Partners who receive inheritance are identified through direct within-household link between the deceased and the survivor partner, since this information is always available. However, adult children inheriting from deceased parents may be directly linked only later in the simulation. For instance, an individual who is 20 years old in 2016 and living with their parents may establish a new household later in the simulation, such as through marriage. At that point, the inheritance link becomes active. We maintain a record of their original household, allowing us to designate them as an heir when one of their parents passes away. The same mechanism could not be applied to those individuals who, at the beginning of the simulation period (i.e., in the starting dataset), live in different households with respect to their parents. We apply an alternative strategy to find adults who receive parental inheritance but have no link to their original household. We assign a probability of receiving parental inheritance using the 2014 wave of SHIW, which includes a specific module dedicated to inheritance and gifts. The likelihood of receiving parental inheritance in the survey year, according to our estimates, depends positively on age and negatively on household size, while the amount received (in absolute terms) depends positively on the level of income and wealth of the recipient.

A simpler approach is applied to gifts, which are simulated probabilistically. The probabilities of being a donor and/or a recipient are simulated separately using estimations based on SHIW 2014.[10] The number of households who donate and receive gifts and the related total amounts are imposed to match each other in terms of totals.

Both inheritances and gifts are subject to a specific transfer tax, commonly referred to as the inheritance tax, which also applies to gifts. This tax has been reintroduced in Italy in 2007, after being abolished in the early 2000s. The tax base consists of the estate received by each recipient, excluded government bonds. The exemption area is set to €1 million.[11] The tax rate is flat and equal to 4% for spouses and direct relatives. The same rules apply to intergenerational *inter vivos* gifts. We simulate the tax in our model in a simplified fashion since we consider only the transmission to spouses and children. We assume that inheritances are split among receiver family members according to Italian rules on inheritances without a will, which represent the most common scenario. This approach implies that inheritances are distributed equally among eligible recipients.

An interesting topic concerns the feedback effects of IGTs on other choices within the model. The model does not incorporate behavioural responses to inheritances. However, the consumption rule takes into account the level of household financial wealth as a control factor. Households that receive large amounts of financial wealth due to inheritance will adjust their saving behaviour accordingly. However, there is no specific modelling of depletion rates or consumption patterns after inheritance reception.

[10] According to SHIW data, the weighted totals of inheritances received in 2014 amount to about €83 billion, while the total inheritances received in Italy according to national accounts elaborated by Acciari et al. (2024) is about €112 billion. For gifts, the SHIW totals are about €17 billion while national totals are about €21 billion.

[11] See Acciari et al. (2024) for a detailed description of the tax and its coverage.

## 5 Simulation Results

This section presents the simulation results for wealth derived from the previously described model. It begins with an overview of demographic trends, followed by an analysis of key patterns in wealth-to-income ratios, capital income, and wealth inequality. Subsequently, the discussion shifts to the specific drivers of wealth inequality over time. The section concludes with an exploration of the role of intergenerational transfers in shaping wealth inequality including simulations of alternative inheritance tax scenarios.

A premise is necessary before going through all the results: for the figures presented in this section, we may observe irregularities in the first years of the simulation time span that coincide with the alignments based on historical official statistics (2016–2021); afterwards the trends become smoother because of the stable alignments discussed in the previous section. While we refer to Conti et al. (2024) for the in-depth validation of each module's short-term outputs where comparisons with real data are available, this paper focuses on long-term outcomes driven by the interaction between demographic and economic factors.

### 5.1 Demography

Figure 3 illustrates the population trends derived from the simulation in T-DYMM. As explained in the previous section, these data are aligned with official projections from the European Commission, highlighting the gradual yet steady ageing of the population. In 2016, the population retains a pyramid-like structure, but by 2050, it transforms into an inverted pyramid, with a significant proportion of individuals over the age of 70. By 2070, the demographic distribution resembles a tall, vertical rectangle, highlighting the growing proportion of individuals aged 90 and older. Figure 4 shows the tendency in household size and share of successors (either spouses or offspring) throughout the simulation period. Both of these correlated figures show a negative trend. The average number of household components decreases over time, from 2.3 in 2016 to 1.8 in 2070. This effect is due to secular tendencies in mating, fertility, and net migration; the long-term alignments of these demographic phenomena are shown in Table 3.[12] Overall, the rise in small households implies that the share of heirs over total population decreases over time (from 1.9% of the sample in 2016 to 0.9% in 2070).

### 5.2 Wealth Trends and Inequality

We then present the results of the microsimulation modelling of Italian household wealth. Figure 5 shows long-term trends in wealth projections based on T-DYMM. The graph also includes key variables that explain wealth accumulation and inequality. On the left-hand axis, we display the wealth-to-income ratio and the share of capital

[12] The population projections adopted in the baseline version of T-DYMM are not the more pessimistic among the available official scenarios (the low fertility scenario from AWG sees the Italian population decreasing down to 48.6 millions in 2070 rather than 53.9 millions in the baseline scenario).

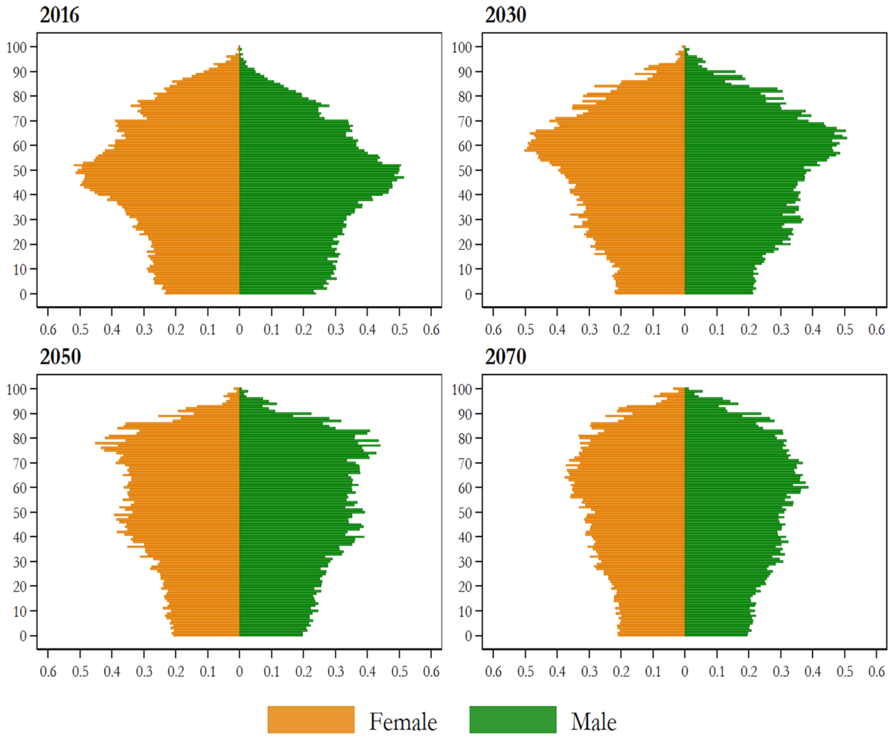


**Fig. 3** Age pyramids. The figure shows the number of individuals in millions on the horizontal axis and their ages on the vertical axis, separated by sex, for the beginning, middle, and end of the simulation period. *Source*: Authors' elaborations of simulation results using T-DYMM

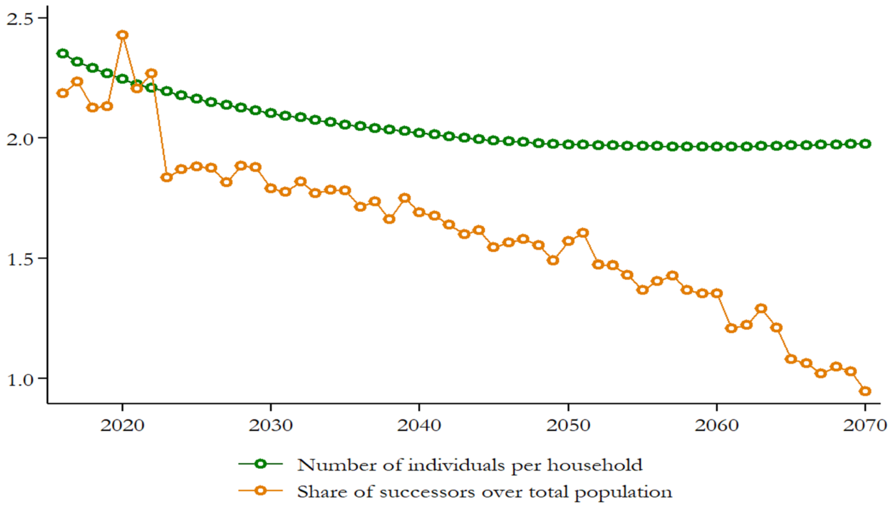


**Fig. 4** Demographic trends. The figure shows the number of individuals per household and the share of successors over the total population. Successors are individuals (spouses or offspring) who receive inheritance. *Source*: Authors' elaborations of simulation results using T-DYMM

income (from housing and financial wealth) as a proportion of total household gross income. On the right-hand axis, we show the Gini index to summarise the inequality evolution.

The wealth-to-income ratio (WIR) is a well-known measure to capture the relevance of property, both real and financial, with respect to the incomes generated within an economy. As noted in the Introduction, Italy has one of the highest WIRs among wealthy countries. The long-term simulation results are influenced by key assumptions regarding relative evolution of income and wealth over time. Indeed, in our model, this translates into the discrepancy between the growth of labour and pension incomes and the returns on real and financial wealth. As explained in the previous section, from 2022 onward, the simulation assumes a positive, slightly above-zero trend in wealth returns. Consequently, there is a gradual upward tendency in the WIR over the long term. However, the ratio remains around a reasonable value of 10. The share of capital income over total household gross income, on the right-hand side of the figure, highlights a broader trend in the Italian economy, under the assumptions of our model. The share of incomes derivied from housing and financial investments is projected to increase relative to the baseline year (from around 7.3 to 13.5), reflecting an increasing role of capital income in the overall income composition over time. The model projects an overall increase in the Gini index for net wealth that. After three decades of decay, the index is expected to rise from about 0.57 in 2040 to 0.70 in 2070.[13] Overall, these results indicate an anticipated rise in the weight of wealth within the Italian economy. However, this growth appears to be distributed unequally across the population over the long term. But why is this the case?

Given the limited flexibility of dynamic microsimulation modelling and the demographic and economic assumptions outlined earlier in the paper, we propose explanations for the expected increase in both the relative weight and the dispersion of wealth observed during the simulation.

We start by looking at other wealth inequality indicators beyond the Gini index, focusing on wealth shares. We study the share of net wealth owned by the bottom 50% of the population, the share owned by the population between the 50th and 90th percentiles, the share owned by those in the top 10% and the share owned by those in the top 5%. The findings are presented in Fig. 6. The trends show how the increase in inequality in the final part of the simulation is driven by the increasing patterns in the top 10% and top 5% shares, while, on the contrary, the share owned by the bottom 50% remains stable over time and the 50–90 share declines. Furthermore, Fig. 13 in Appendix B presents the evolution of the detailed wealth distribution for selected years within the simulated time span. From these data, it is clear that the significant increase in the proportion of households owning more than €5 million by 2070 is the primary driver behind the rise in net wealth inequality over time.

Although the main interest of this work is on long-term outcomes, it is also essential to describe the trends observed throughout the simulation period. The Gini index displays a U-shaped trend, with a pronounced rise at the end of the simulation, beginning after 2040. In Fig. 14 of Appendix B we propose an analysis of wealth inequality

[13] This result is in line with what was found by Morciano et al. (2013). In their work a long-term growing trend in wealth inequality emerges when a reduced-form consumption rule is adopted.

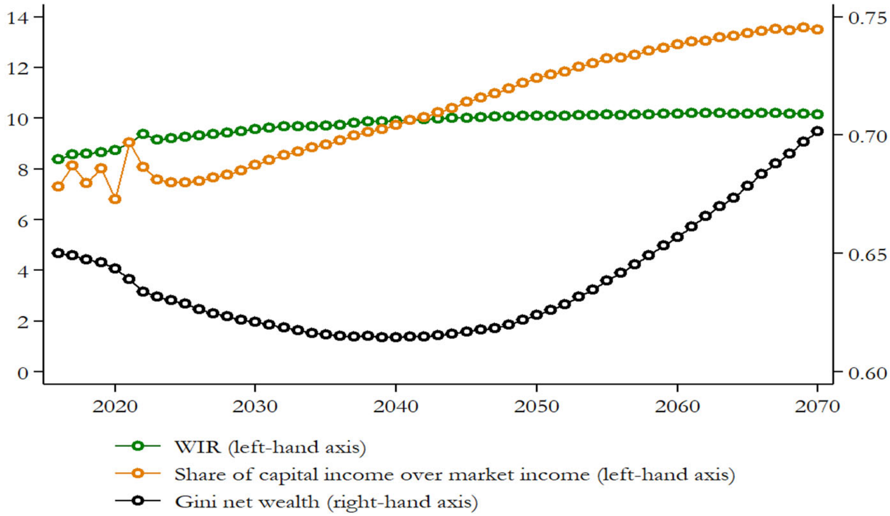


**Fig. 5** Wealth and income long-run evolution. The figure displays, on the left-hand axis, the evolution of the wealth-to-income ratio and the share of capital income over market income; on the right-hand axis, the trend in the Gini index of net wealth. Market income is divided into two components: capital income (financial and rental income) and non-capital income (labour income, work-related pensions, private pensions, and residual income sources). Negative values are excluded in the computation of the Gini index of net wealth. *Source*: Authors' elaborations of simulation results using T-DYMM

that takes age differences into account. In particular, we show the Theil index and the between component of the within-between Theil decomposition by age groups. Notably, while the Theil index follows the trend in Gini, the share of inequality explained by differences between age groups peaks around 2040. After this period, the share begins to decline, driven by the transfer of wealth to younger generations through inheritance. Interestingly, the period from 2035 to 2045 aligns with the expected passing of individuals born in the late 1950s and 1960s. This cohort benefited from stable careers and pensions calculated under defined benefit rules, contributing significantly to the intergenerational transfer of wealth.

Another distinctive feature of T-DYMM is that, under the assumptions on wealth accumulation and the modelling of wealth processes, financial wealth becomes more and more important throughout the simulation time span. Figure 15 of Appendix B shows the tendency of Italian households to own more financial than non-financial (housing) assets in later simulation years, but this occurs mostly for the highest quantiles of the wealth distribution.

We can summarise the main findings regarding the long-run wealth distribution in Italy as follows: (i) wealth is expected to rise its weight in the Italian economy but with an unequal impact; (ii) wealth inequality is expected to surge after 2040, as the baby boomer generation approaches the end of their life expectancy; (iii) financial wealth is expected to play an increasingly prominent role in the Italian economy over time.

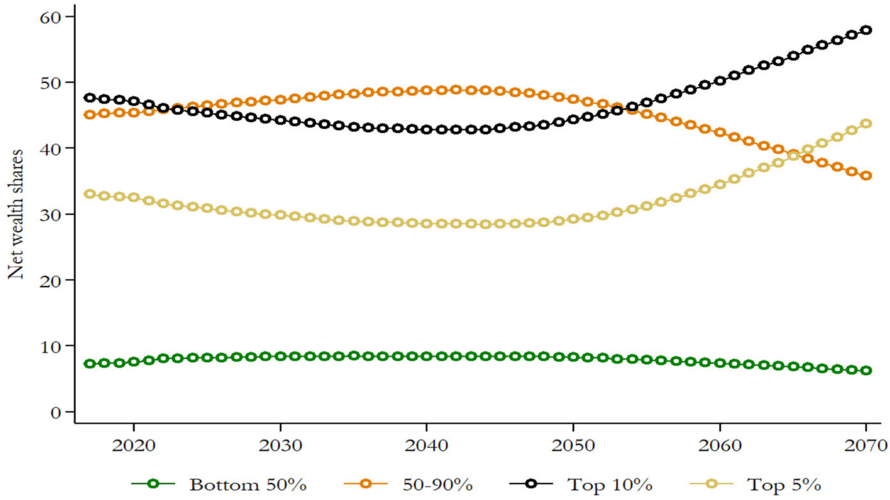


**Fig. 6** Other wealth inequality indicators: wealth shares. The figure illustrates the net wealth shares owned by different population subgroups. Bottom 50% are households below the median of net wealth, 50–90% corresponds to households between the median and the 90th percentile of net wealth, Top 10% is the wealthiest 1/10 of the population, Top 5% is the richest 1/20 of the population. *Source*: Authors' elaborations of simulation results using T-DYMM

### 5.3 The Role of IGTs in Shaping Wealth Inequality

What has been missing from the previous discussion of the simulation results is an analysis of the specific role played by IGTs in shaping the forward-looking evolution of wealth accumulation in Italy. This topic is addressed in the following paragraphs.

First, we show how the size of inheritance in the Italian economy is expected to increase, as illustrated in Fig. 7. This occurs both when computing the ratio of IGTs over total market income and over net wealth. This trend aligns with the historical rise in IGTs observed in Italy, as noted by Acciari et al. (2024). It also helps to explain the previously discussed increase in the WIR and the growing share of capital income (Fig. 5).

Still, the key passage is that of comparing the IGTs with the other channels of wealth variation, discussed in Sect. 4.2. These channels include savings, returns from financial and house wealth and a residual component. In Fig. 8, we present the share of each component contributing to positive wealth variation at specific points in the simulation timeline (starting from 2023, the first year without historical alignments for returns and without the inflation peak). The bar chart represents the shares, while the scatter plot illustrates the trend in the Gini index for each component (excluding the residual component for simplicity). Indeed, the share of intergenerational transfers in the wealth accumulation rises over the simulation time span, moving from less than 30% to around 40% in 2070, the opposite holds for returns and savings. Actually, the initially low share of IGTs with respect to other equalising sources, such as savings, provides another explanation for the trends observed in the simulation up to around 2040. Moreover, the IGTs channel exhibits the highest level of inequality

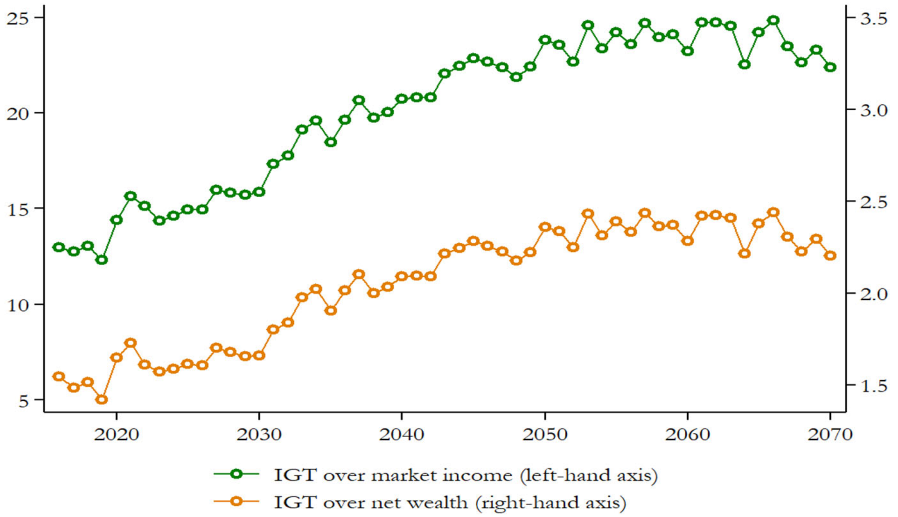


**Fig. 7** Intergenerational transfers as a share of household income and wealth. The figure shows the ratio of intergenerational transfers (IGTs, i.e. inheritances and gifts) over market income (on the left-hand axis) and net wealth (on the right-hand axis). *Source*: Authors' elaborations of simulation results using T-DYMM

among the factors influencing wealth variation. Additionally, the distribution of intergenerational transfers becomes increasingly unequal over time, surpassing the level of wealth inequality itself (measured in Gini percentage points) by a significant margin. This is, according to Nekoei and Seim (2022) one of the two conditions for having a negative impact of IGTs on wealth inequality, the case where the wealth transmitted is more unequal than the original wealth; the second condition is that the intergenerational wealth mobility is low. The rise in the inheritance inequality we see in the final part of the simulation time span increases the probability of having an unequalising impact of IGTs on the wealth distribution.

To identify the role of IGTs in shaping long-run wealth inequality and exploiting the capabilities of the the dynamic microsimulation model, we build two different counterfactual scenarios and compare them with the baseline scenario (as described in Sect. 4.2). In the 'No IGTs' scenario IGTs are not simulated, households cannot receive any additional wealth through this channel, and the wealth owned by the deceased is not redistributed, effectively removing IGTs from the wealth accumulation process. In the 'No IGTs with endowment' scenario, the depleted wealth owned by the deceased is redistributed through an endowment of equal size to the whole population of the households.

The comparison between counterfactuals is shown in Fig. 9 where we analyse the trends in wealth inequality with different scenarios using the Gini index as the distributional indicator.[14] The green dots represent household net wealth inequality in the baseline scenario. The counterfactual without IGTs (yellow dots) shows that that, after the starting 25 years of simulation in which the IGTs have an equalising effect,

[14] In Fig. 16 we illustrate these counterfactual findings with the more comprehensive Lorenz curves that allow us to verify the degree of inequality by quantiles.

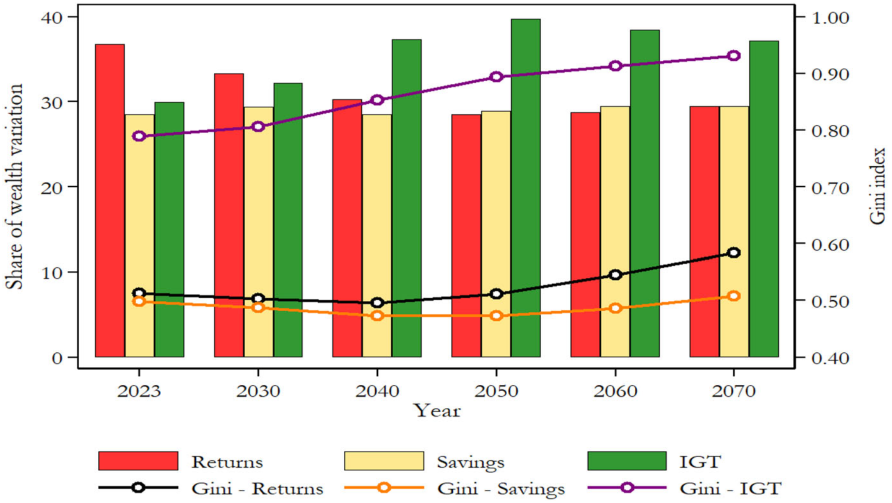


**Fig. 8** Decomposing wealth accumulation channels, share of wealth variation, and inequality. The figure shows, on the left-hand axis, the share of positive wealth variation captured by returns, savings, and IGTs (the residual component is omitted). On the right-hand axis, we include the Gini index of each of the wealth variation's components. Negative values are excluded in the computation of the Gini index of net wealth. *Source*: Authors' elaborations of simulation results using T-DYMM

there is a reverse, and the two lines start diverging significantly. The effect is even more pronounced with the counterfactual without IGTs but with endowment, and the black dots are always below the green line.

The IGTs are expected to play a relevant role in shaping the Italian long-run wealth inequality. This relationship is driven by several factors: demographic trends such as declining fertility rates and a shrinking pool of heirs; inequality between cohorts; and the increasing dispersion in the distribution of intergenerational transfers. These aspects have been discussed in detail in the preceding paragraphs.

### 5.4 Alternative Intergenerational Transfers Tax Scenarios

Finally, we focus on inheritance and gift tax providing a counterfactual exercise with three alternative scenarios: a baseline in which IGTs are simulated and taxed according to the Italian inheritance tax; a 'No tax' scenario in which IGTs are simulated but are not taxed, and a 'French tax' scenario where IGTs are taxed according to the French legislation.

We choose to simulate the French inheritance tax in the Italian context because it is among the taxes with the highest share of revenue as a percentage of GDP, according to OECD (2021). Additionally, it is relatively straightforward to simulate compared to other taxes that exhibit a sufficient degree of progressivity and generates significant revenue. The French inheritance tax falls into the category of 'double progressive tax regimes', meaning that progressivity applies both within and between population groups based on the closeness of the relationship between the receiver and the deceased.

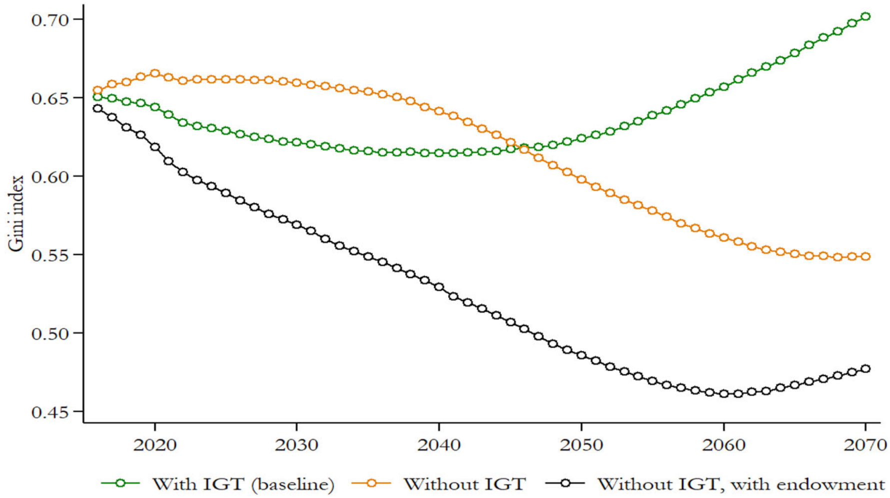


**Fig. 9** Wealth inequality for different IGTs scenarios. The figure shows how the wealth inequality (measured with the Gini index) changes depending on the adopted IGT scenario: baseline (with IGT), without IGT, and without IGT and with an endowment. Negative values are excluded in the computation of the Gini index of net wealth. *Source*: Authors' elaborations of simulation results using T-DYMM

This is in contrast to Italy, where progressivity applies only between groups, based solely on the degree of kinship. No tax is paid between spouses or those in a civil partnership. Heirs (both children and spouses) have a tax-free exemption threshold of €100,000 and are subject to progressive tax rates, with a maximum tax rate of 45% for inherited amounts above €1.8 million.[15]

The results in Fig. 10 show that there is no significant difference in the trend of wealth inequality with or without the presence of the current Italian tax. Then, the simulation provides evidence of a significant reduction in wealth inequality that would occur with the implementation of the French inheritance and gift taxation: the Gini index, in the latter case, would not overcome the value of 0.66 in 2070, four Gini points below the inequality of the baseline scenario. In Fig. 11 we elaborate on this result. The left-hand graph shows the incidence of inheritance tax revenues under different scenarios over nominal GDP, while the right-hand axis compares household equivalised income inequality across the scenarios. The very low incidence of the inheritance tax revenue with the Italian current design, which is nearly zero at the beginning of the simulation, sees a modest increment in the final part of the simulation. This highlights the minimal fiscal impact of the existing system over the simulation period. The same increment becomes a striking upsurge when we simulate the French tax design on the Italian wealth transmission structure (from 0.3 to 3.3% of the GDP). This would give room for non-negligible switches in tax revenue composition both in a short- and long-term perspective, with the aim of financing a generalised tax wedge

[15] We report the tax rate schedule that applies to children: 5% up to €8,072; 10% on €8,072–€12,109; 15% on €12,109–€15,932; 20% on €15,932–€552,324; 30% on €552,324–€902,838; 40% on €902,838–€1,805,677; 45% over €1,805,677. See Drometer et al. (2018) for an overview of inheritance taxation from a cross-country perspective.

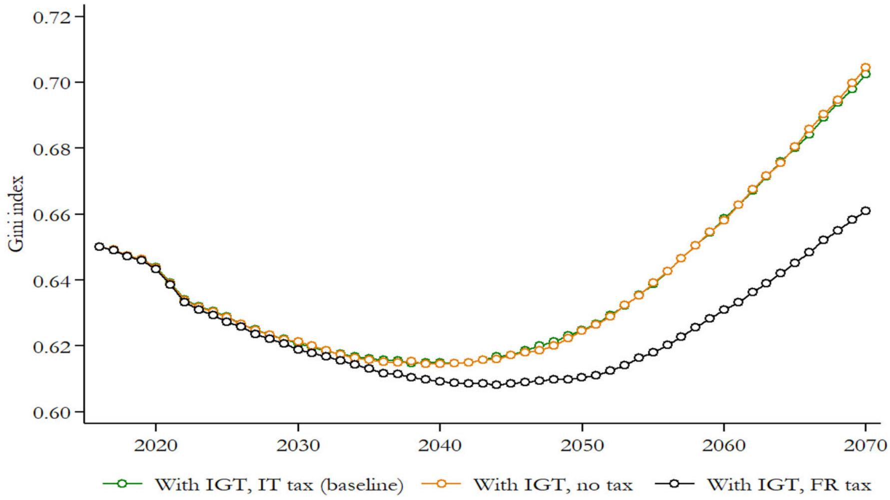


**Fig. 10** Wealth inequality for different inheritance tax scenarios. The figure shows how the wealth inequality (measured with the Gini index) changes depending on the adopted inheritance tax scenario: baseline (with Italian Tax), without tax, and with French Tax. Negative values are excluded in the computation of the Gini index of net wealth. *Source*: Authors' elaborations of simulation results using T-DYMM

cut[16] or specific interventions on the expenditure side. Tax revenue projections are then strengthened by the evolution of income inequality, which we know has many different determinants and whose movements are scant, especially with a baseline scenario and stable economy. Notably, the Gini index of equivalised market income under the French inheritance tax scenario is 0.5 points lower than under the Italian tax scenario, indicating a modest but meaningful reduction in income inequality. Keeping in mind certain limitations, such as the assumption of no behavioural adjustments throughout the life cycle in response to significant changes in the tax levy,[17] it is noteworthy that adopting a thorough reform in this tax policy today would likely yield significant equalising effects on wealth distribution in the long run, with effects becoming more pronounced in 20–25 years, and even more so when considering incomes in the very long term. Although this lag in impact might initially appear discouraging, it presents certain advantages. Especially when complemented with other redistributive strategies, such as capital income or wealth taxation as noted by Fize et al. (2022), it can effectively counteract other distributional tendencies. Moreover, the gradual and delayed nature of its effects could increase its political acceptability, despite certain specific considerations unique to Italy.

16 According to the latest statistics, Italy exhibits one of the highest implicit tax rates on labour among developed economies, with a rate of 45.9% in 2022, well above the OECD average rate of 34.6%; while taxes on property and taxes on goods and services in terms of GDP percentage are slightly above OECD averages (OECD 2022).

17 An increase in the transfer tax, also known as inheritance or estate tax, can trigger several adjustments in economic behaviour, the most important are the reduced incentive to accumulate wealth and the tax evasion and avoidance that generate economic inefficiencies.

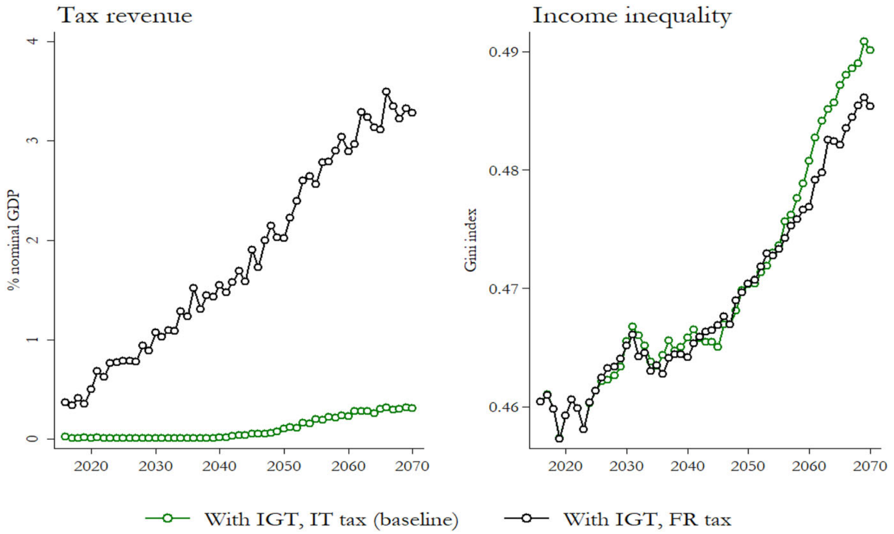


**Fig. 11** Tax revenue and market income inequality for different inheritance tax scenarios. The figure illustrates, on the left-hand panel, the incidence of tax revenue from the inheritance tax over nominal GDP with the Italian tax rules and the French tax rules, while, on the right-hand panel, the trends in income inequality depending on the different adopted tax rules. *Source*: Authors' elaborations of simulation results using T-DYMM

## 6 Conclusions

The literature on intergenerational transfers (IGTs) and their relationship with wealth inequality using historical data has expanded significantly in recent years. However, the transmission of wealth across generations remains an intriguing area of study, not only from a historical perspective but also with a forward-looking approach, especially in light of expected demographic and socioeconomic trends. The paper aims to fill this gap in the literature by analysing the long-run wealth distribution in Italy, a country which is interested by low fertility and high wealth-to-income ratios. We also contribute to the literature on the role of intergenerational transfers in shaping household wealth inequality assuming a long-run perspective. To achieve this, we employ a dynamic microsimulation model, T-DYMM, which integrates multiple socioeconomic and demographic processes. This model allows us to simulate the future evolution of wealth and its distribution in an ageing society.

Following a thorough process of data cleaning and adjustment, we construct a distribution of household wealth that aligns as closely as possible with national accounts data. We then project the long-term wealth choices of Italian households, embedding them within a broader model encompassing demographic, labour, pension, and tax-and-benefit modules. Our analysis focuses on wealth accumulation dynamics, particularly the role of IGTs, inheritances and gifts, as a driver of inequality.

Our primary results reveal a significant increase in the importance of wealth in the Italian economy over the long term. However, this growth is unevenly distributed across the population. Net wealth inequality is projected to remain relatively stable until around 2040, after which it is expected to rise steadily. IGTs are shown to play a crucial role in shaping long-term wealth inequality in Italy. This relationship is driven by demographic trends (e.g., declining fertility and number of heirs), disparities in wealth across cohorts, and rising inequality in the distribution of IGTs. These conclusions are supported by counterfactual simulations, made possible through the use of dynamic microsimulation models.

We also examine the effects of alternative inheritance tax scenarios. The first scenario compares the current system, which includes IGTs, against a hypothetical scenario with no IGTs. The second scenario evaluates the Italian IGT tax system against two alternatives: one with no taxation and another adopting the more progressive French tax regime. Our findings suggest that under the current Italian tax system, wealth inequality trends change minimally. However, adopting a French-style inheritance and gift tax system has the potential to significantly reduce wealth inequality over the long term.

Our methodology has several limitations. For instance, in the baseline version of the model, we do not account for uncertainty nor adjust for survey non-response at the top of the wealth distribution. As a result, our findings likely represent a lower bound of the long-run 'true' level of wealth inequality. Additionally, we do not directly model the housing and financial markets, limiting our ability to capture divergent long-term trends in asset investments.

Our findings and model offer valuable insights for policymakers seeking tools to address long-term income and wealth inequality. Although rooted in Italian data, our analysis has broader implications for other industrialised countries confronting similar demographic and economic challenges, such as ageing populations and rising wealth inequality.

## Appendix A Additional Information on Wealth Data

### A. 1 House Wealth

In Table 5, we present a summary of house wealth statistics for Italy in 2015 according to different data sources. AD-SILC reduces the discrepancy with NA in terms of total amounts compared to SHIW. Regarding inequality, we obtain a distribution that is slightly more unequal than the SHIW-based distribution, as measured by the Gini index. AD-SILC underestimates the share of first houses over total houses relative to NA, although the definition of first house adopted is different between data sources. The National Accounts administrative data are collected at the individual level, hence within each household more than one individual may own a 'main residence'. This concept is indeed slightly different from that of first house, used in survey data. Major differences arise when looking at second houses, as SHIW significantly under-reports multiple ownership. We can conclude that administrative information on house wealth used in this paper overall contributes to a greater adherence with NA totals while preserving the distributional patterns observed in SHIW.

**Table 5** House wealth statistics

| Source | Total amount | Gini index | First houses (%) | HH with other houses (%) |
|---|---|---|---|---|
| AD-SILC | 5,029 | 0.577 | 53.1 | 50.5 |
| SHIW | 4,191 | 0.569 | 66.3 | 17.2 |
| NA | 5,333 | - | 62.1 | - |

The table shows a comparison between AD-SILC and NA house wealth totals (Billions of Euros), the house wealth Gini index, the share of first houses out of the total number of houses and the share of households owning more than one house

## A. 2 Financial Wealth—Correction for Under-Reporting

Typically, the weighted totals of financial wealth do not match the amounts reported in the National Accounts (NA). For instance, in 2015, the total amount of financial wealth in Italy was €690 billion according to the SHIW using sample weight, whereas €3284 billion according to NA (excluding insurance reserves and standard guarantees), with a ratio of one fifth between the former and the latter. In terms of total net wealth (real wealth plus financial wealth minus liabilities), the SHIW accounts for about 53% of the NA value. The discrepancy may be due to different sources of measurement error (sampling errors due to item non-response, along with non-sampling errors like under-reporting). For this paper we dealt with one of these error sources, so we carried out a correction procedure for under-reporting of financial wealth and liabilities at the household level.

The correction procedure involves three steps, as in Boscolo (2019): (i) correction for ownership, following Brandolini et al. (2009); (ii) attribution of financial wealth to households who are 'new' owners; and (iii) correction for the amount of financial wealth owned, following D'Aurizio et al. (2006).

In the first step, we estimate the probability of owning the specific financial instruments that are part of financial wealth, such as liquidity, government bonds, corporate bonds, stocks, mutual funds, insurance. We first run a multinomial model to determine the probability of owning a more or less sophisticated investment portfolio using information from SHIW (2006–2016). As controls we insert: number of income earners within household, educational attainment, age, geographical area of living, quartiles of financial and house wealth, quartiles of household income, plus other macro controls on stocks and bonds returns. Then, we use logistic models to analyse the impact of socioeconomic and financial variables on the probability of owning a specific instrument. We run a separate univariate regression for the ownership of liabilities. In Table 6 we show descriptive results related to ownership correction for 2016 SHIW.

In the second step, we impute the value of financial activities for households that newly acquired financial assets after the first step, using matching based on Mahalanobis distance metrics. The variables used for imputation include household income quartiles, number of income earners, occupational status, housing ownership, sex, geographical area of residence, age class and education level.

Finally, we use ratios between 'true' and declared values found in SHIW 2002 by D'Aurizio et al. (2006) to adjust the levels of financial activities for both original

**Table 6** Correction of financial instruments ownership

| | Original (%) | After correction (%) |
|---|---|---|
| A: Single financial instrument | | |
| Liquidity | 93.3 | 93.3 |
| Govt. bonds | 6.6 | 19.0 |
| Corp. bonds | 5.8 | 16.7 |
| Stocks | 10.3 | 18.3 |
| Liabilities | 15.6 | 22.3 |
| Total | 100.0 | 100.0 |
| B: Number of financial instruments (liquidity excluded) | | |
| 0 | 82.3 | 74.6 |
| 1 | 13.3 | 7.9 |
| 2 | 3.6 | 6.3 |
| 3 | 0.7 | 11.1 |
| Total | 100.0 | 100.0 |
| C: Ownership of one financial instrument by: | | |
| Gender | | |
| Men | 20.5 | 29.9 |
| Women | 14.6 | 20.4 |
| Age | | |
| $< 30$ | 4.0 | 4.6 |
| 30–65 | 17.2 | 24.3 |
| $> 65$ | 19.0 | 27.6 |
| Geographical area | | |
| North | 28.4 | 39.2 |
| Centre | 19.5 | 32.2 |
| South | 3.5 | 4.3 |
| Degree | | |
| Less than degree | 15.6 | 22.5 |
| Degree | 33.5 | 47.7 |
| HH income quartiles | | |
| First | 3.1 | 3.7 |
| Second | 8.6 | 12.7 |
| Third | 20.3 | 29.9 |
| Fourth | 38.8 | 55.1 |

The table displays the comparison between SHIW original descriptive statistics on financial assets and those after the implementation of the under-reporting correction procedure. *Source*: Authors' elaborations on SHIW 2016

**Table 7** SHIW totals before and after correction (Billions of Euros)

| | Original (1) | After correction (2) | NA (3) | Ratios (1/2) | (2/3) |
|---|---|---|---|---|---|
| Financial wealth | 697.0 | 2,461 | 3,146.9 | 0.283 | 0.782 |
| Liquidity | 390.3 | 1,029.8 | 1,273.0 | 0.379 | 0.809 |
| Govt. bonds | 59.9 | 270.4 | 412.2 | 0.221 | 0.656 |
| Corporate bonds | 66.4 | 511.8 | – | 0.130 | – |
| Stocks | 180.4 | 649.1 | 1,461.7 | 0.278 | 0.794 |
| Liabilities | 250.9 | 368.5 | 692.1 | 0.681 | 0.532 |

The figures correspond to totals weighted according to survey weights. Financial wealth is the sum of liquidity, government bonds, corporate bonds and stocks. In the National Accounts it was not possible to distinguish between stocks and corporate bonds, therefore in the ratio (2/3) we consider these two categories jointly. *Source*: Authors' elaborations on SHIW 2016

and new owners. We impute the ratios for each financial instrument and given certain households' demographic and socioeconomic characteristics.

The final outcome of the correction procedure can be reviewed in Table 7 that compares original SHIW totals with corrected totals and the national accounts from the Bank of Italy. The total amount of financial wealth after the correction is equal to €2409 billion, while liabilities amount to €374.7 billion. The last two columns of the table illustrate how the adjusted totals compare to the original SHIW totals and NA totals. Corporate bonds show the most significant correction, followed by government bonds, stocks, and liquidity. When considering NA ratios, liquidity appears to be closest to the NA total among the various forms of financial wealth, while government bonds are farthest. After the correction, liabilities still exhibit less satisfactory results, accounting for only 54% of the NA total.

### A. 3 Financial Wealth—Statistical Matching

In the following we propose a much detailed description of the statistical matching between AD-SILC and SHIW data. We took inspiration from Pisano and Tedeschi (2014), who combined the SHIW with the Household Budget Survey (HBS). The link function relies on a set of common characteristics surveyed in both surveys and properly recodified to make them the most homogeneous. As for the matching unit, the reference is the household. However, the definition of household head is fairly different between the two datasets. To address this, we recode the reference person for matching purposes. We assume that the husband or male partner is the household head, unless the female spouse or partner is the primary earner. In Table 8 we propose a comparison between the two datasets, focusing on the key variables used in the matching algorithm.

To control for systematic differences between the samples and achieve more accurate matching, we divide the combined dataset into 45 cells (or strata) based on household real wealth quintiles and nine household typologies based on parental relationship, age of the head and household size. We then match units within the same

**Table 8** Main variables adopted for statistical matching

| | SHIW | SILC |
|---|---|---|
| Female | 50.5 | 57.0 |
| Age class: < 30 | 3.7 | 4.5 |
| 30–40 | 13.8 | 14.3 |
| 40–50 | 20.7 | 20.4 |
| 50–65 | 28.1 | 27.0 |
| 65+ | 33.7 | 33.7 |
| Foreigner | 6.4 | 8.0 |
| North | 47.5 | 47.7 |
| Centre | 20.5 | 20.5 |
| South | 32.1 | 31.8 |
| Education: Primary | 22.13 | 23.38 |
| Lower secondary | 28.39 | 28.36 |
| Upper secondary | 35.89 | 33.94 |
| Tertiary | 13.58 | 14.32 |
| Employed | 50.19 | 51.24 |
| Unemployed | 5.1 | 5.32 |
| Inactive | 44.71 | 43.44 |
| HH income (avg) | 30,715 | 34,743 |
| Individual income (avg) | 22,118 | 20,805 |
| No. hh components: 1 | 33.66 | 32.39 |
| 2 | 26.70 | 27.49 |
| 3 | 17.59 | 19.56 |
| 4 | 16.03 | 15.81 |
| 5 | 6.02 | 4.74 |

All results are population-weighted. The individual demographics characteristics refer to the head of household. *Source*: Authors' elaborations on SILC 2015 and SHIW 2016

cell. The choice was guided by both statistical fit and economic considerations since a higher correlation between real and financial wealth can be found compared to other variables (e.g. income). The wealth variables imported from SHIW in the AD-SILC file are financial assets held values (liquid assets, government securities, bonds and stocks) and liabilities.

Next, we aim to compare the distributions of financial activities and liabilities between the *donor* dataset and the *recipient* one. Figure 12 shows the comparison between kernel densities of the (unconditional) distribution from SHIW data and the

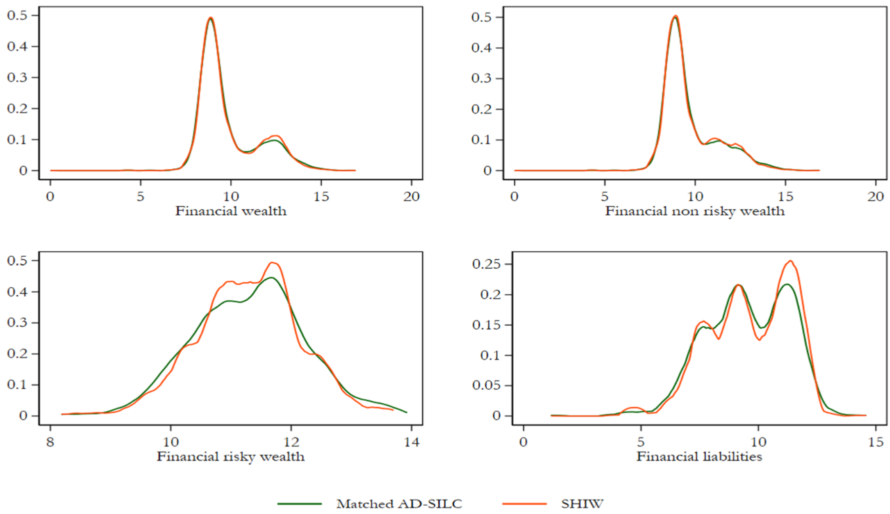


**Fig. 12** Distribution of matched AD-SILC Vs. SHIW financial wealth and liabilities. The figure shows the kernel densities of matched SILC data (green) and SHIW data (orange). *Source*: Authors' elaborations based on SHIW and AD-SILC data (2016)

**Table 9** Net Wealth weighted averages by deciles (Thousands of Euros), 2015

| | DWA | AD-SILC | Ratio |
|---|---|---|---|
| Bottom 50% | 52.2 | 48.1 | 0.922 |
| Decile D6 | 197.7 | 184.3 | 0.932 |
| Decile D7 | 259.9 | 248.8 | 0.957 |
| Decile D8 | 350.4 | 349.1 | 0.996 |
| Decile D9 | 509.0 | 532.9 | 1.047 |
| Decile D10 | 2082.4 | 1407.0 | 0.676 |

DWA figures are originally provided quarterly, here we show yearly averages. *Source*: authors' elaborations on AD-SILC (2015)

matched AD-SILC file. The four sub-figures refer to financial wealth (overall and broken up by risky and non-risky components) and liabilities. For a successful data fusion procedure, the distributions should ideally overlap almost perfectly at the lowest level of validity, which is preserving marginal distributions. In our case, the distributions of financial wealth and non-risky wealth seem to be quite similar, although there are differences in the distributions of liabilities and risky wealth.

### A. 4 Comparison with DWA

In this section we compare the net wealth distribution of AD-SILC with that of the newly available quarterly experimental statistics on the Distributional Wealth Accounts (DWA) for the household sector, in line with national accounts aggregates. This recent data source has been developed by the ECB with a methodology that aims at filling the entire gap between survey totals and national accounts aggregates (explained in detail in EGDFA,2024). Table 9 provides a clear message: the gap between AD-SILC and national account totals, seen in Table 2, is ascribable, for the greatest portion, to the missing wealth information at the top of wealth distribution (tenth decile).

## Appendix B Additional Wealth Simulation Results

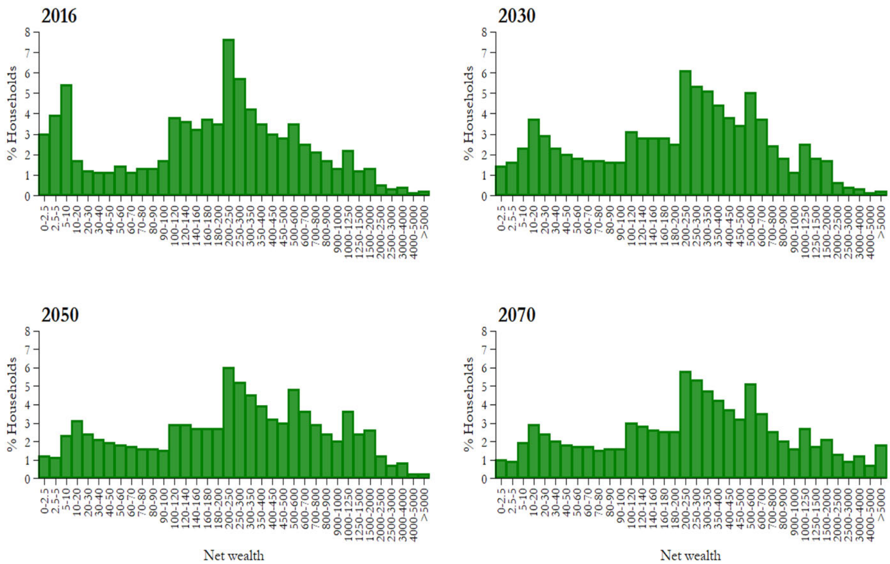


**Fig. 13** Frequency density function for net wealth. The figure shows the frequency density function for net wealth in certain time periods of the simulation. Values are expressed in 2023 prices. Values in thousands of Euros on the x-axis. Zero and negative values are excluded. The share of households with zero (negative) net wealth gradually varies from 13.0% (0.6%) in 2016 to 9.9% (1.7%) in 2070. *Source*: Authors' elaborations of simulation results using T-DYMM

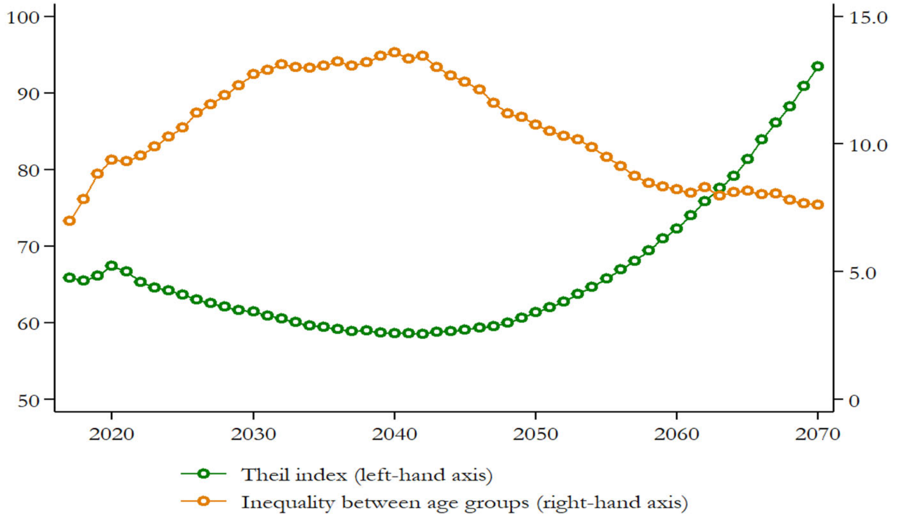


**Fig. 14** Theil index and inequality between age groups. The figure displays the trend in the Theil index of net wealth (left-hand axis) and how much the between component of the Theil index explains the total Theil index (right-hand axis, expressed in percentage points). *Source*: Authors' elaborations of simulation results using T-DYMM

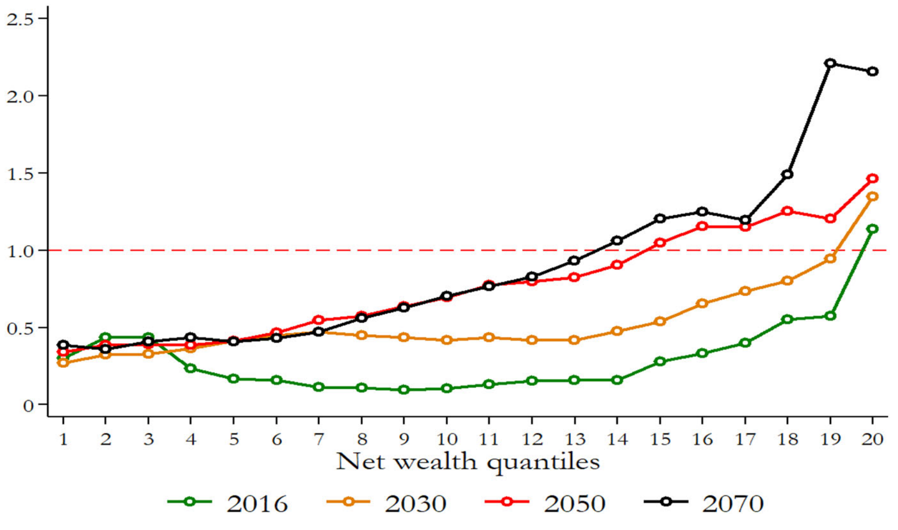


**Fig. 15** Ratio between financial wealth and house wealth by quantile of net wealth. The figure illustrates the ratios between financial and house wealth by quantile of net wealth. Values beyond 1 denote that financial wealth is on average greater than house wealth. Zero and negative net wealth values are not used in the calculation of quantiles. *Source*: Authors' elaborations of simulation results using T-DYMM

## Appendix C Counterfactuals Robustness

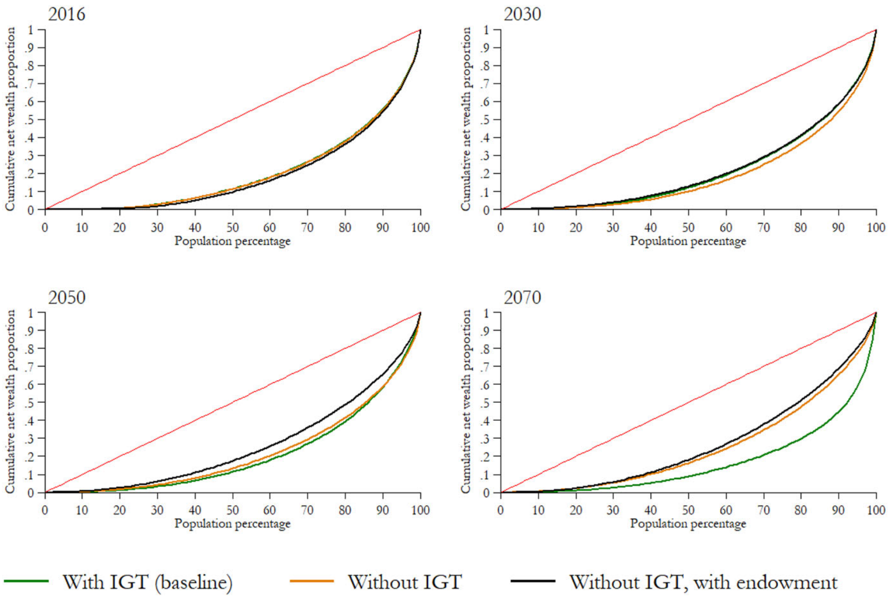


**Fig. 16** Lorenz curves of net wealth. The figure shows Lorenz curves of net wealth based on different IGT counterfactuals. Zero and negative values are excluded. *Source*: Authors' elaborations of simulation results using T-DYMM

## Appendix D Regression List

See Table 10.

**Table 10** List of regressions adopted in the wealth module

| Process | Regression dependent variable | Data source |
|---|---|---|
| Financial investment decision | Ownership of government bonds | SHIW 2010-16 |
| Financial investment decision | Ownership of corporate bonds | SHIW 2010-16 |
| Financial investment decision | Ownership of stocks | SHIW 2010-16 |
| Financial investment decision | Ratio of liquidity over total fin. wealth | SHIW 2010-16 |
| Financial investment decision | Ratio of gov. bonds over total fin. wealth | SHIW 2010-16 |
| Financial investment decision | Ratio of corp. bonds over total fin. wealth | SHIW 2010-16 |
| Financial investment decision | Ratio of stocks over total fin. wealth | SHIW 2010-16 |
| Inter vivos transfers | Probability of making transfers | SHIW 2014 |
| Inter vivos transfers | Amount transferred (absolute value) | SHIW 2014 |
| Inter vivos transfers | Probability of receiving transfers | SHIW 2014 |
| Inter vivos transfers | Amount received (absolute value) | SHIW 2014 |

**Table 10** continued

| Process | Regression dependent variable | Data source |
|---|---|---|
| Inheritance | Probability of receiving inheritance | SHIW 2014 |
| Inheritance | Amount received (absolute value) | SHIW 2014 |
| House investment decision | Probability of buying house | SHIW 2010-16 |
| House investment decision | Log-value of purchased house | SHIW 2010-16 |
| Rent | Probability of paying rent | SHIW 2010-16 |
| Rent | Ratio of rent paid over household income | SHIW 2010-16 |
| Rent | Probability of received rent | AD-SILC 2015 |
| Rent | Ratio of rent received over household income | AD-SILC 2015 |
| Consumption | Log-level of household consumption | SHIW 2002-16 |

**Data Availability** This research relies on data that cannot be shared due to privacy restrictions.



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