BELGIAN WEALTH INEQUALITY, 1935-2022[*]

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July 7, 2026

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Abstract

In the absence of a wealth register, Belgian wealth inequality needs to be estimated. Here I apply the mortality multiplier approach to Belgian inheritance tax tabulations and administrative microdata, collectively covering 1935 to 2022. Belgian wealth inequality has strongly declined during the 20th century and seems relatively stable in recent years. I triangulate my estimates with national accounts aggregates and previous work on Belgian wealth inequality. The evolution of Belgian wealth inequality is in line with other European countries for which long-run estimates are available.

Keywords: Wealth inequality, Inheritance, Mortality multipliers, Belgium

JEL Codes: D3, G5, H2, N3

[*]Many thanks to the officials at AAPD, VLABEL, Research Department FOD Financiën, Statbel, and the National Bank of Belgium for supplying and documenting the data underlying this study, as well as kindly answering my numerous questions. Further gratitude is due to the DPO and legal team at Ghent University for their help in the data transfer process, and to the Ghent University librarians for tracking down many of the older texts cited here. I am highly grateful to Thérèse Bastin, Micael Castanheira, André Decoster, Bertel De Groote, Mark Delanote, Jan De Mulder, Paula Gobbi, Freddy Heylen, Arthur Jacobs, Sarah Kuypers, Marthe Mareels, Clara Martínez-Toledano, Ive Marx, Javier Olivera, Koen Schoors, Guy Van Camp, Dirk Van de gaer, Rudi Vander Vennet, Jonas Vanderkelen, Stijn Van Houtven, Christophe Van Langenhove, Pieter Van Rymenant, and Maisarah Wizan for useful comments and discussions. I also want to thank seminar participants at Ghent University, the National Bank of Belgium, the University of Antwerp, the IT18 winter school, the FIT Wealth Workshop Tampere, the Free University of Brussels, the 2nd III/LIS Comparative Economic Inequality conference, the ESPAnet Netherlands-Flanders Early Career Researchers' Day, the Ancestor's Tale project meeting, the Eleventh ECINEQ Conference, the University of Liège, CAPE UCLouvain, the ISI Munich Wealth Conference 2025, the 7th AMSE summer school, and the World Inequality Conference 2026. Some of the resources and services used in this work were provided by the VSC (Flemish Supercomputer Center), funded by the Research Foundation Flanders and the Flemish Government.

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I am the recipient of a PhD Fellowship grant from the Research Foundation Flanders (11PP924N).

1 Introduction

The distribution of wealth is a topic of growing societal and academic relevance (Georgieva 2020; Piketty 2014). For a considerable number of countries, long-run series of wealth inequality have now been constructed. In general, wealth inequality is found to have declined for most of the twentieth century, while for more recent years the wealth distribution is estimated to have become either roughly stable or increasingly unequal (Alvaredo et al. 2017; Waldenström 2024).

In contrast to other Western countries, little research has been conducted on the Belgian wealth distribution (Bastin et al. 2023). In the absence of a wealth register, there are essentially three data sources to estimate how wealth is distributed (Kopczuk 2015): (1) capitalized administrative capital income data; (2) wealth surveys; (3) estate[1] tax data.[2] Previous Belgian wealth inequality research is based on either capital income tax data or wealth surveys, with one exception discussed below.

A first strand of the Belgian wealth inequality literature relies on capital income tax data supplemented with survey data (Frank et al. 1978; Rademaekers and Vuchelen 1999). These pioneering studies are of limited relevance today as they concern only a small time period and were required to make a number of ad hoc assumptions. Bastin et al. (2023) have recently stated that the capital income tax approach can no longer be applied to Belgium given how capital income taxes are currently levied.[3]

A second strand relies on HFCS wealth survey data (e.g. Apostel and O'Neill 2022; De Mulder et al. 2024; Engel et al. 2022; Kuypers and Marx 2020; Vermeulen 2018).[4] Given the issues of (1) differential unit non-response (wealthier households are less likely to respond to a wealth survey), and (2) underreporting of wealth (resulting in a severe mismatch between wealth survey and national accounts aggregates), wealth surveys have their limitations for estimating Belgian wealth inequality (especially with respect to the top of the distribution).[5] Moreover, HFCS survey data is only available from 2010 onwards.

An alternative approach to estimating the wealth distribution is based on inheritance tax data (often referred to as the 'mortality multiplier' approach). The fundamental assumption behind this method is that deaths in a particular year can be interpreted as random draws from a correspond-

[1] In principle, an 'estate tax' is levied on the entire net wealth left at death while an 'inheritance tax' is levied on the amount of net wealth from the perspective of the receiver (Pacolet and Van De Putte 2000). In Belgium, there is an inheritance tax but not an estate tax. However, the net wealth at death can be obtained from inheritance tax declarations.

[2] These three estimation approaches must have been known to 20th century Belgian economists, as they are mentioned in Babeau (1978). The inheritance approach was likely not applied in earlier work due to data constraints (explained below).

[3] Capital income taxes are levied at source and tax payers are under no obligation to declare their capital income in their tax return. As result, there are no comprehensive individual-level administrative data on capital income.

[4] The HFCS is currently the only reliable wealth survey available for Belgium. Descriptive analyses of Belgian HFCS data are provided by Du Caju (2013) (wave 1), Du Caju (2016) (wave 2), De Sola Perea (2020) (wave 3), Kuypers and Marx (2020) (wave 3), and De Sola Perea and Van Belle (2022) (wave 4). To the best of my knowledge there is no reliable wealth survey before 2010. From 2024 onwards, Koen Inghelbrecht and Margaux Bearelle (Ghent University) run an annual wealth survey for Belgium. However, for now no methodological report nor estimates of wealth inequality have been published.

[5] This does by no means imply that wealth surveys are useless. In fact, wealth surveys are likely reliable for households outside the top of the distribution. Moreover, wealth surveys contain many variables of interest that are unavailble in administrative microdata.

ing group alive in that year with the same age, gender, and social background. On the basis of this assumption weights can be determined to rescale inheritance tax data at the micro level, resulting in a reweighted wealth dataset representative for the population as a whole. In recent years, the mortality multiplier approach has been applied to a number of countries such as Italy (Acciari et al. 2024), France (Garbinti et al. 2016), the United Kingdom (Alvaredo et al. 2018), Sweden (Roine and Waldenström 2009), and the United States (Kopczuk and Saez 2004).

Applying the mortality multiplier approach to Belgium is desirable for at least three reasons: (1) in contrast to wealth survey data, inheritance tax data goes back to 1935, thus rendering it possible to capture long-term evolutions in wealth inequality; (2) for the post-2010 period, inheritance-based estimates can be compared with HFCS-based estimates, thus reinforcing or diminishing their reliability (triangulation)[6]; (3) in Belgium all inheritances are taxed and thus recorded, which makes the Belgian inheritance tax microdata especially suited as a basis to estimate the wealth distribution relative to both the HFCS survey (suffering from differential unit non-response) and the inheritance tax system in other countries (for which coverage is generally much lower, Alvaredo et al. 2024).

In light of these considerations, this paper aims to study the long-run evolution of Belgian wealth inequality using inheritance tax data. The estimates presented here concern the distribution of net wealth among adult individuals. In line with the inequality literature (Roine and Waldenström 2015), net wealth is defined as total assets minus liabilities. Valuation is at market prices. For the baseline series, children are excluded from the analysis.[7] The unit considered is the individual rather than households. The pragmatic reason for this focus on the individual is that inheritance tax returns are available at the individual level.

Main findings. Belgian wealth inequality has decreased during the 20th century and seems to be neither increasing nor decreasing in the 21st century. For 2022 the estimated top 1% wealth share is around 22%, about as much as the bottom 75% of individuals combined. Wealth inequality in Flanders seems comparable to wealth inequality in Belgium overall, whereas wealth inequality may be higher in Brussels and lower in Wallonia. At the top of the distribution, movable assets dominate the asset composition. On average, men hold more net wealth than women across all age categories. This gender wealth gap is especially pronounced at older age. A decomposition reveals that men are overrepresented at both the bottom and the top of the wealth distribution, with women being overrepresented at the middle. The stable inequality trend found for the 21st century sheds doubt on previous work estimating that Belgian wealth inequality has declined in recent years. Belgian wealth inequality appears to have evolved in line with other European countries for which long-run estimates are available.

As will become clear, there are many data limitations which induce uncertainty in the resulting estimates. Therefore, one should interpret this paper as an attempt to construct the best available estimates given major data constraints (quite similarly to related work for other countries, see Blanchet et al. 2024). Moreover, for the 20th century only top shares can be reliably estimated (as explained below) and only top share estimates are thus presented. However, as an empirical regularity, top share trends tend to approximate trends in overall inequality measures such as Gini coefficients (Alfani 2024).

[6]Babeau (1978) already mentions that triangulation is desirable.

[7]Including children would increase wealth inequality, since children tend to have little or no wealth. In this paper I follow the WID convention and classify individuals aged 20 or above as adults, see Blanchet et al. (2024)

Contributions. My work is closely related to Alvaredo et al. (2024), who as an application of their methodological work estimate Belgian wealth inequality from 1935 until 1994 based on publicly available inheritance tax tabulations.[8] The present paper contributes by (i) providing a consistent wealth inequality series from 1935 until 2022; (ii) drawing on a thorough investigation of context-specific knowledge (with implications for some of the assumptions in the estimation procedure); (iii) validating key assumptions for the 20th century series using 21st century microdata; and (iv) applying an alternative and more reliable approach for the 2009-2022 period.

While focusing on wealth inequality, the analysis presented here has broader implications. For example, I document substantial variation across estimates of the aggregate value of Belgium's immovable property stock in recent years. Moreover, private foundations may be less important for tax avoidance than has been suggested in public debate, as gross taxable wealth in such foundations is negligible in the aggregate.

This paper additionally contributes to the literature on mortality multiplier wealth inequality measurement. Previous studies tend to approach weighting crudely, due to data constraints. Here I am able to link to sociodemographic information at the microlevel, which allows for considerably more precise reweighting than what has until now been achieved.[9] Moreover, I innovate methodologically by using a machine learning approach in one of my weighting specifications. This machine learning approach imposes less structure on the weights, and is thus able to provide a more data-driven estimate of the wealth distribution. Lastly, the precise differential weights I apply provide broadly favourable evidence for the validity of the mean mortality multiplier approach that has recently been proposed by Alvaredo et al. (2024).

Roadmap. Section 2 presents the available data for Belgium. Section 3 explains the methods used to estimate the wealth distribution. Section 4 gives the results of the analysis. Section 5 relates these results to national accounts aggregates and previous estimates for Belgium and other European countries. Section 6 concludes with a brief summary.

2 Data

The data available to apply the inheritance tax approach to Belgium can be divided into four categories: (1) inheritance tax tabulations; (2) gift and inheritance tax microdata; (3) Statbel census and national registry microdata; (4) mortality statistics from the Human Mortality Database.

1. Yearly inheritance tax tabulations are available for 1935-1994. Inheritance tax tabulations were published by the national statistical institute as part of its statistical yearbooks.[10] These inheritance

[8] Moreover, in footnote 18 of their seminal work on the Belgian wealth distribution, Frank et al. (1978) note that Jean Walravens would publish a related study using inheritance tax data in the future. However, I have not been able to find this study and neither is such a study mentioned in the later work of Rademaekers and Vuchelen (1999), so it may not have materialised. A number of Belgian historians have also looked at small subsamples of inheritance declarations for specific years and locations: Balthazar (1971) for Ghent, Bekers (1964) for Antwerp, Van Laer (2022) for Borgerhout, Ryckbosch (2012) for Aalst, Van den bussche (2023) for Ninove, Desmul (1985) for Kortrijk, Schuermans (1970) for Turnhout, Dombrecht and Ryckbosch (2017) for coastal Flanders. Lastly, there is an ongoing research project at UAntwerpen, VUB, and KULeuven that aims to similarly study Belgian inheritance declarations (AncestorsTale 2024).

[9] With the possible exception of Alvaredo et al. (2018).

[10] The tax administration supplied the national statistical institute with summary data until 1965 and digitised indi-

tax tabulations include (a) inheritance by size categories; (b) number of inheritance declarations per size category; (c) inheritance total (i.e. sum of all individual inheritances) per size category. For unclear reasons, pre-1968 inheritance categories and inheritance totals are by net inheritance (i.e. gross inheritance minus liabilities), whereas from 1968 onwards tabulations are by gross inheritance (i.e. do not subtract liabilities).[11] The statistical yearbooks were discontinued in 1995 (with the last reported tabulation for 1994).

2. Gift and inheritance tax microdata. Registered gifts have been recorded from 1990 onwards for movable assets, and from 2003 for immovable assets.[12] The gift data for movable assets are unfortunately unreliable before 2013 (Appendix E). Inheritance tax data are available starting in 2009.[13] All pre-2015 microdata are held by the federal tax administration (AAPD), while Flemish data from 2015 onwards are managed by the Flemish tax administration (VLABEL). While gifts are subdivided in movable and immovable assets, inheritances are subdivided in movable assets, immovable assets, main household residence, family company, and liabilities.

3. Statbel census and national registry data. For 1991, 2001, 2011, and 2021, Statbel holds microdata on three main categories of socioeconomic characteristics for the entire Belgian resident population: (1) labour market conditions; (2) educational background; (3) residence characteristics (e.g. owner or renter). The census data is not completely comparable for all years, due to differences in the included variables and data collection methods. From 1992 onwards, Statbel has annual microdata on demographic characteristics (age, sex, number of children, region of residence). From 2006[14] onwards, Statbel data includes fiscal income at both the household and the individual level.

This paper makes use of Statbel sociodemographic microdata for the entire living resident population. Furthermore, these data are linked to decedents in the inheritance tax microdata.

4. Mortality statistics from the Human Mortality Database (HMD). The HMD contains digitised annual population and mortality statistics by age and gender for Belgium, going back to before 1935. These statistics were originally obtained from the statistical yearbooks (until 1994).

Gap in inheritance data for 1994-2009. There is a notable gap between the end of the inheritance tax tabulations (1994) and the first year of the administrative microdata (2009). Unfortunately, neither Statbel nor the federal tax administration holds distributional information of any kind for this period. These missing years make the analysis less complete than what one would have hoped for but still sufficiently encompassing to study the long-run evolution of wealth inequality.

Belgium's wealth transfer tax system. To have a good understanding of the inheritance and gift tax data used for this paper and their limitations, one might be interested in an overview of the Belgian wealth transfer tax system in the 20th and 21st century. Such an overview is provided in Appendix A.

vidual declarations from 1968 onwards (Lismont 1978). From 1968 onwards computations underlying the tabulations were done digitally (Lismont 1978).

[11] The correction I apply for this is explained later.

[12] As mentioned in Appendix A, taxpayers can choose whether they want to register gifts of movable assets. Only registered gifts are subject to gift taxation. If the donor dies within 3 years (depending on the region and the year), then unregistered gifts are subject to (higher) inheritance taxation.

[13] Note that from end-2004 onwards, some inheritance declarations are available in the administrative microdata, but the data is not complete and the inclusion criteria are unclear.

[14] 2006 is the declaration year, so the data are available from income year 2005 onwards.

3 Methods

The inheritance tax approach to estimating the wealth distribution can be subdivided into two methods (for an extended discussion of these methods, see Appendix B).

The *differential mortality multiplier method* (Appendix B.1) is based on the observation that decedents in any given year are not representative for the living population in that year. The reason for this non-representativeness is that not every individual has the same chance to die (e.g. young people have lower mortality rates than old people). However, one can create a representative sample of the living population by applying appropriate weights to the raw inheritance data. This method is called 'differential' as weights differ in function of differences in gender, age, and socioeconomic background between decedents.[15]

The *mean (or simplified) mortality multiplier method* (Appendix B.2) applies the same weight to each death in a certain year. In other words, every death is representative of the same number of living individuals (hence the 'mean'). This method might appear unreliable given the non-representativeness of the decedent population for the living. However, as an empirical regularity, the top share of the wealth distribution tends to be well-approximated by the top share of the inheritance distribution (Alvaredo et al. 2024). Alvaredo et al. (2024) derive analytically the conditions under which this finding holds (see Appendix B.2). For other parts of the distribution, the inheritance distribution is less representative of the wealth distribution. Hence, the mean mortality multiplier method can only be used to retrieve top wealth shares. However, as an empirical regularity, the evolution of top wealth shares seems to approximate the evolution of overall inequality measures such as Gini coefficients (Alfani 2024).

While the mean mortality multiplier method has been shown to provide a good approximation for the top of the wealth distribution, using differential mortality multipliers undoubtedly leads to more precise estimates. As the inheritance tax tabulations available for Belgium do not contain information on age or gender, the differential multiplier method can only be applied to administrative microdata from 2009 onwards.

In what follows, I explain how these two methods can be applied to Belgian inheritance tax tabulations and administrative microdata.

3.1 Mean mortality multiplier approach

As mentioned above, the mean mortality multiplier can be applied to both inheritance tax tabulations and administrative microdata.

Inheritance tax tabulations, 1935-1994. Going from inheritance tax tabulations to an estimate of the wealth distribution using the mean mortality multiplier method involves three main steps.

1. Solving the mismatch between inheritance declarations and deaths. In all years, the number

[15] Note that in some studies, the reweighting only happens with respect to age and gender, and the mortality gradient in socioeconomic background is not taken into account. For example, in their baseline estimate Acciari et al. (2024) weight by age, gender, and region.

of recorded deaths is higher than the number of inheritance declarations.[16] The share of adult deaths that are not included in the inheritance tabulations decreases from over 50% of total adult deaths in 1935 to slightly over 35% of total adult deaths in 1994 (Figure 1).

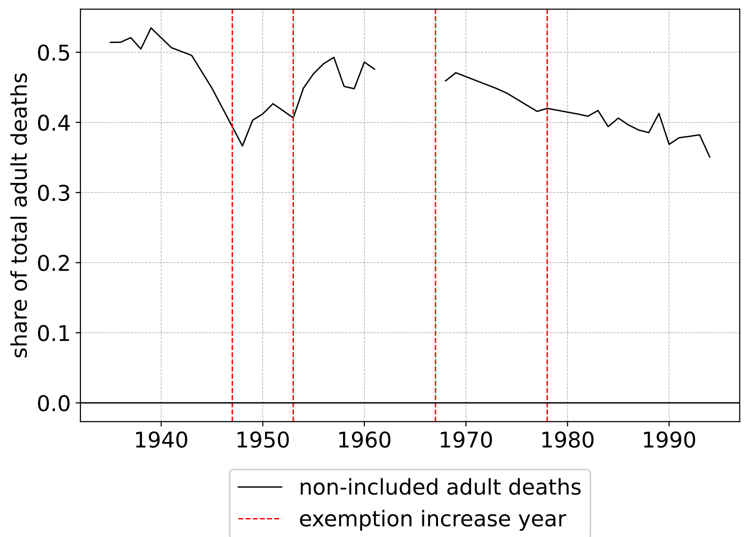


Figure 1: Share of decedents not included in inheritance tabulations, 1935-1994. Non-included adult deaths are defined as the difference between the total number of adult decedents in a given year and decedent count in the inheritance tabulation of that year, divided by the total number of adult decedents. The red dotted lines indicate years in which the inheritance tax exemption threshold increased. Especially in the first half of the series, such exemption increases are associated with non-inclusion increases afterwards. As explained in the main text, some fully exempted inheritances were unregistered. **Source:** Own calculations based on HMD mortality statistics and inheritance tax tabulations.

The high share of non-included decedents might be surprising given that the inheritance tax applied to all asset categories regardless of the recipient from 1919 onwards (De Reu 2011). Moreover, in principle all inheritances, even those which are fully exempted or with net negative assets, should be declared to the tax administration (Donnay 1948). However, as a purely administrative practice with no legal basis, for poor people (De Reu 2011; Frank 1973) with no immovable property (Lismont 1978) no inheritance declaration tended to be made. A similar issue applies to inheritance data for other countries (see e.g. Garbinti et al. 2016 for France).

Not correcting for non-inclusion of a substantial number of decedents would underestimate wealth inequality, given that these non-included decedents are substantially poorer than the included decedents.[17] However, since there is no reliable information on the net wealth holdings of the non-included, a plausible assumption needs to be imposed. Based on the Belgian context and the available literature, I implemented a number of corrections for the non-included. As a baseline correction (see Appendix G for a justification), I assume that the average net wealth of the non-included is equal to 10% of the average net wealth of the included decedents. Other specifications do not substantially alter the resulting wealth inequality estimates (see Appendix G).

[16]Own calculations based on inheritance tax tabulations and the Human Mortality Database. As mentioned above, coverage for the inheritance tax microdata is near-100%. Here the issue is that coverage for the inheritance tax tabulations is not as good.

[17]Unless one uses a reliable external wealth total, which is not available for Belgium during the 20th century. The lack of a reliable external wealth total is an often-encountered issue in long-term historical wealth inequality studies (e.g. Roine and Waldenström 2009).

2. Moving from inheritance brackets to an estimated inheritance distribution. If one aims to estimate the wealth distribution, one should move from the brackets in the inheritance tabulation to an estimated distribution. A standard assumption in the inequality literature used to be that (the top of) the distribution is Pareto-distributed. However, this assumption has been criticised and more flexible functional specifications have been proposed. Blanchet et al. (2022) developed the Generalized Pareto Interpolation (GPI) approach, and show that it leads to an excellent fit with empirical microdata. I have applied the GPI approach to retrieve a distributional estimate. As shown in Appendix I using the microdata sample, the GPI approach is likely very precise.

3. Assume that the top shares in the inheritance distribution are a good representation of the top shares in the wealth distribution ('the mean mortality multiplier approach'). As mentioned, there is evidence that the top share of the wealth distribution is well-approximated by the top share of the inheritance distribution (Alvaredo et al. 2024). This assumption seems to be approximately valid, as assessed by comparison of the mean mortality multiplier results for 2009-2022 with the differentially weighted inheritance tax data for the same years (Appendix B.2.3).

Data limitations of inheritance tax tabulations. There are two important limitations. First, from 1968 onwards the data are tabulated with respect to total assets, while net assets (i.e. total assets minus liabilities) are of interest. I correct for this by inferring net assets, using bracket-specific liability information. A more detailed explanation and the applied correction is provided in Appendix H. Overall, as shown in Appendix J, the applied correction does not distort the distributional estimates.

Second, the tabulations are distorted by substantial tax avoidance and evasion. As explained in Appendix C, tax avoidance and evasion is likely concentrated in movable property and thus at the top of the distribution. Given the uncertainty involved and lack of external data on tax avoidance and evasion in the 20th century, I do not apply a correction for this issue. Hence, a major limitation of the estimates presented in this paper is the non-correction for tax avoidance and evasion which likely implies an underestimation of wealth inequality.

There are four minor limitations that are likely to have little impact on the distributional estimate, and for which I do not correct. A first issue is that tabulations are not available for a small number of years.[18] The absence of tabulations in specific years does of course not impact the general trend in the data. Second, tabulations are based on time of declaration rather than time of death.[19] As a result, tabulations in any specific year contain a large proportion of deaths from the previous year (e.g. Lismont 1978). Third, liabilities at death include funeral costs since funeral costs are legally considered to be a debt of the estate. The tabulations do not allow to exclude funeral costs. Fourth, in a limited number of years (mainly concentrated during and immediately after WWII), the tabulations are inconsistent at the bottom of the distribution.[20] I do not correct for this but drop years with inconsistent tabulations.

Inheritance tax microdata, 2009-2022. Two main steps are involved in going from inheritance tax microdata to a distributional estimate in a mean mortality multiplier approach.

[18] The largest gap consists of 5 years between 1962 and 1968 (possibly due to a large tax reform implemented in 1962, which may have limited the tax administration's resources).

[19] For the applicable declaration timelines, see Appendix A.

[20] For example, the third bracket in 1940 should capture inheritances with a value of at least 5 but less than 10 monetary units. The net inheritance total is 76 300 units and the number of individuals is 5 240. Therefore, the average net inheritance is around 15 units, which does not make sense as it falls outside of the inheritance size bracket.

1. Aggregate gifts close to death and add to net inheritance total. Gift flows have become substantial from 2004 onwards (Appendix A). Hence, for recent years, it is imperative to correct for tax avoidance via pre-death gifts, as such behaviour is likely concentrated at the top of the distribution.

As a baseline assumption, I aggregate registered gifts up to 3 years before death (the results are robust to other time periods, see Appendix K). Gifts are deflated using a GDP price index.[21] The 3-year horizon is chosen for consistency, since unregistered movable gifts are as a legal requirement added to the inheritance if the donor dies within 3 years after death (depending on the region and year).[22] Moreover, there is some evidence that tax avoidance tends to take place close to death (Goupille-Lebret and Infante 2018; Kopczuk 2007). Additionally, as mentioned by Alvaredo et al. (2018), if the gift horizon is too extended, inconsistencies could arise as the receiver of the gift might die during this period (in that case, the gifted amount will be captured in the aggregated gift total of the donor and in the inheritance data of the receiver).

At the same time, the inheritance tax microdata is available from 2009 while reliable 3-year-back gift data can only be used from 2016 onwards (Appendix E). Hence, the gift correction implies that useful information will be thrown out. Moreover, for the distributional estimates, gifts are only an issue to the extent that they differ over time and in function of inheritance size (if constant, the distributional estimate will be the same). Therefore, the results below include estimates with and without gift data correction (the latter starting in 2009, the former in 2016).

2. Assume that the top shares in the inheritance distribution are a good representation of the top shares in the wealth distribution ('the mean mortality multiplier approach'). As mentioned, there is evidence that the top share of the wealth distribution is well-approximated by the top share of the inheritance distribution (Alvaredo et al. 2024). This assumption seems to be approximately valid, as assessed by comparison of the mean mortality multiplier results for 2009-2022 with the differentially weighted inheritance tax data for the same years (Appendix B.2.3).

Data limitations of microdata. In principle, the coverage of the administrative microdata is 100% (i.e. the entire distribution is known exactly). While in practice 100%-coverage is not entirely achieved, the impact of the non-included population is minimal and not taken into account in the remainder of this paper (see Appendix F for more information).

A more serious issue is that liabilities are not fully captured in the microdata, for two reasons. The first reason is that inheritance declarations for decedents with net negative wealth are unrecorded in the dataset.[23] Decedents with net negative wealth appear as individuals with zero net wealth in the microdata.

The second reason is that in recent years in Belgium liabilities are to a large extent covered by a corresponding life insurance. If a debtor dies, then the life insurance company reimburses the creditor for the remainder of the liability. So, if a mortgage holder were to die, her mortgage would be paid off by the insurance company and her inheritors would inherit a house without a mortgage. Unfortunately, the repayment of the liability by the life insurance company is not captured in the inheritance tax data.

[21] The deflator is from WID.world, accessed on 02/08/2024 (variable code: inyixx999i).

[22] There are some exceptions, see Appendix A.

[23] At least not in Flanders. The data from the federal administration does include a non-negligible amount of net negative estates, but these are set to zero as the inclusion criteria are unclear (see also Appendix F).

One possible solution would be to replace liabilities in the microdata with HFCS survey data, e.g. based on percentile matching. However, the HFCS does not seem to capture liabilities very well either (Engel et al. 2022). Hence, I did not implement a correction along these lines.

Neither Belgium's financial market authority (FSMA) nor Belgium's private insurance confederation (Assuralia) were able to supply data about the proportion of liabilities covered by life insurance policies, so the scale of the issue is unclear. However, one should keep in mind that liabilities account for only around 12% of private net wealth in the Belgian national accounts (see Appendix R). While there will be some distortion in the distributional estimate due to missing liabilities, its impact is likely limited.

While I do not correct for missing liabilities in my baseline series, in Section 5.1 I rescale to national accounts aggregates. In my rescaling procedure, I allocate missing liabilities in proportion to immovable property (as missing liabilities mainly consist of mortgage loans). Rescaling does not substantially alter the distributional estimates. The most important limitation of this correction is that the age profile of mortgage holders is not taken into account, since older individuals may have considerable immovable property holdings but no mortgage debt.[24]

A third issue is that funeral costs are added to the liabilities in the microdata. Since 2015, the Flemish tax administration automatically assumes that funeral costs amount to 6k euros unless the inheritors submit their own funeral cost proofs.[25] For all positive net wealth estates, I subtract the inflation-corrected fixed funeral costs from movable liabilities.[26] If as a result movable liabilities become negative, I set them to zero. The distributional estimates are robust to this correction (see Appendix Figure S.2).

A fourth issue is that the annual death count implied by the microdata slightly exceeds the number of official deaths as reported by Statbel (see Appendix L). The reason for this small mismatch is likely due to a limited number of input mistakes by tax officials and Statbel's inclusion criteria for official deaths[27]. I correct for this by restricting the microdata sample to individuals that occur both in Statbel's microdata and in the inheritance tax microdata.

A fifth issue consists of the non-distinction[28] between donors and recipients for around 30% of the administrative gift observations. To solve this issue, I make conservative assumptions about the distribution of gifts among donors and recipients (for a detailed explanation see Appendix M). The distributional estimates are robust to this correction (Appendix M).

Lastly, tax avoidance and evasion are only partially captured (see Appendix C for a detailed discussion). Tax avoidance is captured to some extent, as any applied exemptions are recorded in the data and as I am able to include gifts registered in Belgium close to death. However, unregistered gifts or gifts registered outside of Belgium are unrecorded and thus not included in the estimates presented here. Tax evasion is unrecorded[29] and thus wholly uncaptured. In the baseline series, I

[24] The implication of this limitation is conservative, i.e. this will lead to an underestimation of wealth inequality.

[25] The amount is inflation-corrected. The other Belgian regions do not have a similar 'fixed' funeral cost option.

[26] One might argue that it is more consistent to not correct for funeral costs, given that no correction is applied to the 20th century data. However, given that the funeral cost correction is automatically applied in Flanders from 2015, that would not lead to a fully consistent series either.

[27] For example, infant deaths are only recorded in the national registry if the infant lives until January 1st (Otavova et al. 2024).

[28] Only the aggregated sum of 'titularissen' is recorded.

[29] This is not entirely true, since tax evasion can be regularised. However, inheritance tax regularisations are not

do not apply further corrections for tax avoidance and evasion. However, as a robustness check, I add off-shore wealth estimates and wealth held in private foundations to the distributional estimates (see Section 4.2). There is no doubt that even with these robustness checks a large part of tax avoidance and evasion is unaccounted for. As a second correction, I proportionally rescale to national accounts aggregates (see Section 5.1). Given that tax avoidance and evasion are likely concentrated at the top of the distribution, the wealth inequality estimates presented in the remainder of this paper are likely underestimates.

3.2 Differential mortality multiplier approach

As explained previously, the differential mortality method can only be applied to inheritance tax microdata.

Inheritance tax microdata, 2009-2022. Going from inheritance tax microdata to an estimate of the wealth distribution using the differential mortality multiplier method involves three steps.

1. Determine weights by age, gender, and socioeconomic background. In the literature, differential mortality multipliers are often quite roughly approximated. As the microdata underlying this paper includes detailed sociodemographic information at the individual level, more precise reweighting is possible than what has previously been achieved.

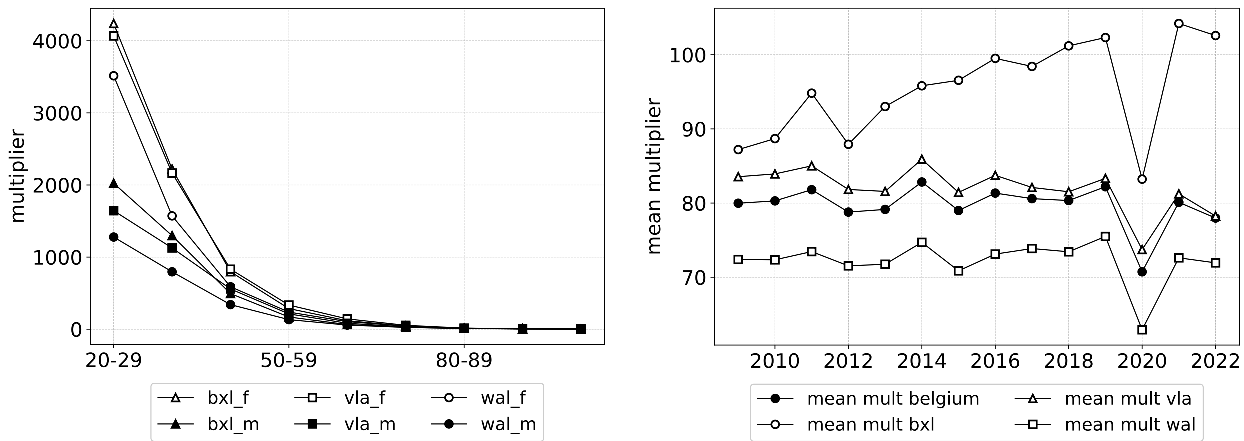
In order to ensure the robustness of the results, three different weighting schemes are applied (explained in more detail in Appendix N):

- **'Naive' weighting**: weights by age, gender, and region. These weights can be considered 'naive' as they do not take into account the social gradient in the mortality rate (see Appendix B.1 for a further explanation of the social gradient);
- **'Theory-driven' weighting (baseline)**: weights by age, gender, region, and socio-economic status group. These weights are 'theory-driven' as the definition of socio-economic status is derived from the demographic literature and imposed on the microdata (see Appendix N.1);
- **'Data-driven' weighting**: weights by age, gender, region, and predicted inheritance rank group. These weights are 'data-driven' as the inheritance rank group is predicted using a machine learning model trained on the inheritance data (see Appendix N.2).[30] This paper is the first to apply a machine learning approach to construct mortality multipliers.

For each of these schemes, weights are calculated in the same way. Groups are defined in both the living population (using the Statbel microdata) and in the decedent population (using the Statbel microdata linked to the inheritance tax data). Then the number of living individuals in each group are divided by the number of decedents in that group. The resulting weights are subsequently applied to the inheritance data.

included in the available microdata. Tax revenue from inheritance regularisation becomes somewhat substantial from 2013 onwards (Rekenhof 2016).

[30] Such a machine learning approach to wealth inequality measurement is in line with recent work in the literature. For example, Van Langenhove (2025) estimates net wealth of PSID-observations between 1969 and 1984 using a machine learning model.



(a) Average across years

(b) Average across gender and age

Figure 2: Differential mortality multipliers, average across all microdata years (2009-2022) by age, gender and region (panel a) and average across gender and age by region and year (panel b). The left panel shows the multipliers by age, region, and gender applied to rescale the inheritance observations, averaged across all microdata years. The right panel presents the average multipliers by region and for Belgium overall. 'bxl' refers to Brussels, 'vla' refers to Flanders, and 'wal' refers to Wallonia. As all weight specifications at least consist of a decomposition by age, gender, and region, the results shown here apply to all three weighting schemes. **Source:** Own calculations based on Statbel microdata.

In the remainder of this paper, the results are based on the theory-driven weights as these are likely to provide the best approximation of the social gradient in the mortality rate.[31] However, all main results are robust to the applied weighting scheme (Appendix O). The fact that the results are not driven by the operationalisation of socioeconomic status heightens confidence in their reliability.

Given the low number of deaths among young people, young decedents receive a considerable weight in the differential weighting procedure (Figure 2, panel a). The differential multipliers steadily decrease by age, as more people die relative to the living population. Moreover, young female decedents get allocated higher weights than young male decedents, as the mortality rate among women is substantially lower for young age categories. In addition, average differential multipliers are roughly stable across all microdata years (Figure 2, panel b). One exception is Brussels where multipliers increase over time, likely due to Brussels'growing and relatively young population. As expected, there is a drop in the average multiplier in 2020 due to the increased death rate during the covid pandemic.

2. Aggregate gifts close to death and add to net inheritance total. As explained in Appendix C, registered gifts are used to avoid inheritance taxation at death. Therefore, such gifts need to be taken into account. I follow exactly the same aggregation process and 3-year pre-death default as for the mean mortality estimates (see Section 3.1). Gifts are thus again deflated using a GDP price index. Moreover, as for the mean mortality multiplier method and due to the unreliability of movable gift microdata pre-2013 (see Appendix E), the results below include series with and without gift correction (as the no-gift series can be constructed from 2009, while the gift-included

[31] The advantage of the data-driven approach is that no further assumptions on the definition of socioeconomic status need to be imposed. However, the data-driven approach proxies socio-economic status with inheritance rank, which might not be entirely valid. The fact that both the theory-driven and the data-driven approach lead to similar results indicates that the imposed baseline differential weighting scheme does not drive the results.

series is only obtainable from 2016).

3. Rescale inheritance tax data ('differential mortality multiplier approach'). This step is straightforward.

Data limitations of the inheritance tax microdata. The same six limitations apply as explained in Section 3.1, and I correct for them in exactly the same way.

4 Results

In this Section the results are presented. The mean mortality multiplier estimates are given first, followed by the results from the differential mortality multiplier approach.

4.1 Mean mortality multiplier approach (1935–2022)

Here I present the results of the mean mortality multiplier approach. As explained in Section 3.1, the main assumption behind this method is that the top of the inheritance distribution is a good proxy for the top of the wealth distribution. This assumption comes with considerable uncertainty, and the results that follow should be interpreted with caution.

There are two breaks in the estimated series. These breaks indicate that notwithstanding efforts to create a long-run comparable series, the resulting estimates before and after these breaks might not be fully comparable. A first break is situated between 1962 and 1968, as no tabulations are available for these years and given that the tabulations are constructed differently before and after the break. A second break exists for 1994-2009 and 1994-2016. The inheritance tabulations end in 1994. Inheritance microdata is only available from 2009 onwards, and reliable gift history microdata is only available from 2013 onwards. Given that for the baseline 3-year pre-death gift history is included, the gift-adjusted series starts in 2016.

When interpreting the results of the mortality multiplier method, one should take care to look at trends or levels across multiple years rather than at individual data points (Roine and Waldenström 2009). In some years the inheritance distribution might be somewhat distorted if one or more extremely rich individuals die (as was the case in the US when Steve Jobs died, Garbinti et al. 2016).

During the course of the 20th century, Belgian wealth inequality has declined considerably (Figure 3). In 1935, the top 1% held 41% of all net wealth. In 1994, the top 1% held slightly less than 20% of all net wealth. In contrast, 21st century wealth inequality seems stable. The top 1% net wealth share does not vary much, regardless of whether one takes into account gifts or not. The inheritance-only top 1% share is 15% in 2022, while the gift-corrected 2022 top 1% share stands at 18%.

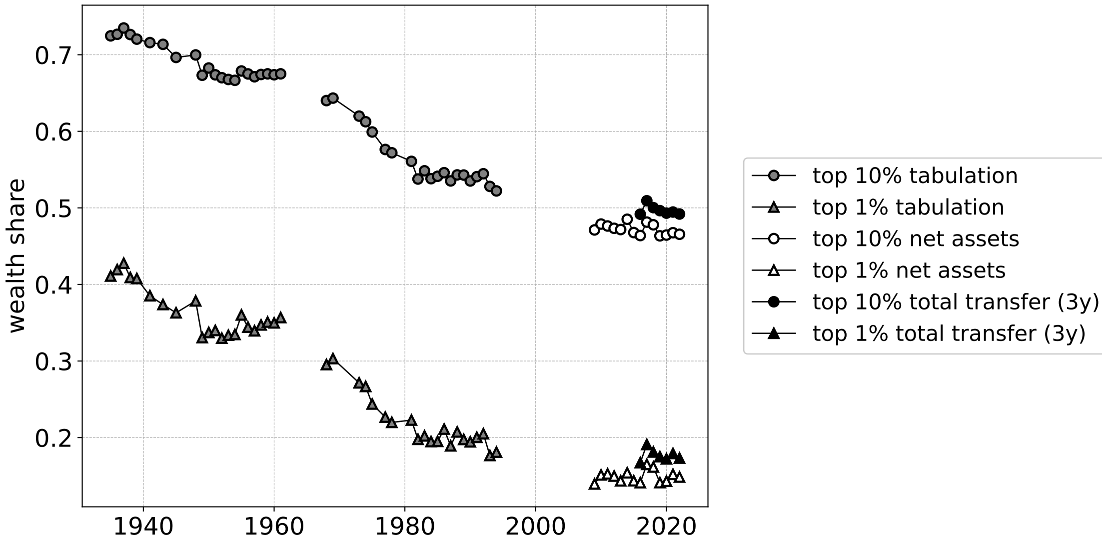


Figure 3: Mean mortality multiplier top 1% and 10% wealth share estimates for Belgium, 1935-2022. This figure depicts the evolution of net wealth shares estimated using the mean mortality multiplier method. The 1935-1994 series is based on inheritance tax tabulations ('tabulation'). The 2009-2022 series is exclusively based on inheritance declarations ('net assets'), while the 2016-2022 series takes into account 3-year pre-death gift history ('total transfer (3y)'). As discussed in Appendix B.2, estimates for the top 10% are likely less accurate than for the top 1%. **Source:** Own calculations based on administrative inheritance and gift microdata.

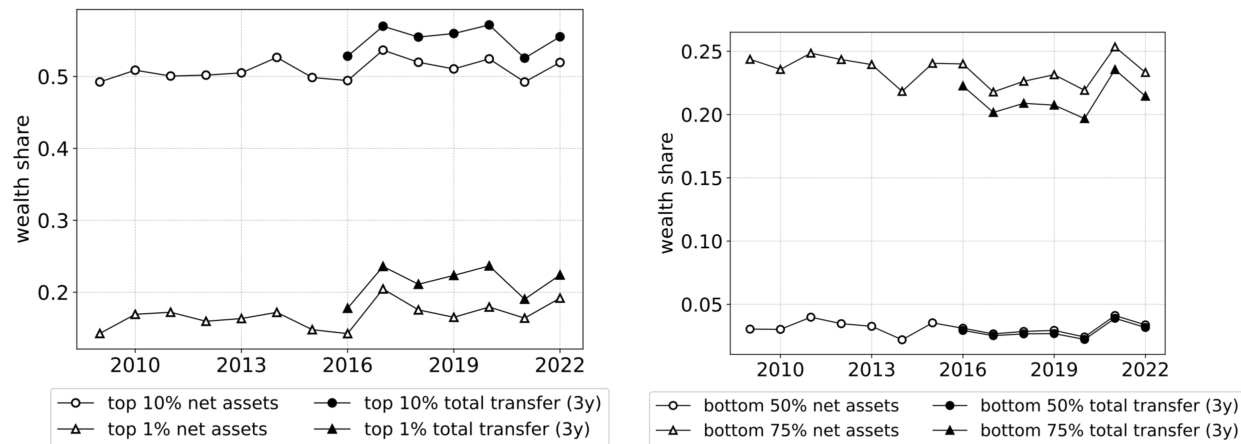
4.2 Differential mortality multiplier approach (2009–2022)

Here I present the results for the differential mortality multiplier approach. As discussed in Section 3.2, the main assumption behind this approach is that deaths can be interpreted as random draws from the corresponding living population after controlling for sociodemographic characteristics. There should be no doubt that the differential mortality multiplier approach in principle leads to more accurate results than the mean mortality multiplier method, due to the granular reweighting of the data.

As noted before, taking gifts into account is preferable but given that reliable gift corrected series are only available from 2016 onwards, inheritance-only results starting in 2009 are reported as well. Moreover, as mentioned previously, one should be careful to look at trends and levels across data years, as sampling variability at the top induces year-to-year variability in the inequality metrics.[32]

Wealth concentration. There is no evidence for either a declining or a rising trend in Belgian wealth inequality from 2009 onwards. In the inheritance-only series, the estimated top 10% share is 52%, and the top 1% share attains 19% in 2022 (Figure 4, panel a). The estimated gini coefficient is on average 0.70 (Figure 5). As expected, the gift-corrected estimates lead to an increase in the level of inequality. Gift-correction after 2016 does not imply a different inequality trend than non-gift-corrected estimates after 2016. The gift-corrected top 10% share stands at 56% in 2022 (Figure 4, panel a). The top 1% net wealth share is around 22%, about as much as the bottom 75%

[32]As an indication of the impact of sampling variability, excluding observations with wealth above 10 or 50 million euros leads to considerably more stable estimates (Figure S.3 in Appendix S).



(a) Top 1% and top 10%

(b) Bottom 75% and bottom 50%

Figure 4: Baseline differential mortality multiplier top 1% and top 10% wealth share (panel a), and bottom 50% and 75% wealth share (panel b) estimates for Belgium, inheritance only and including gifts up to 3 years before death, 2009-2022. This figure depicts the evolution of net wealth shares estimated using the baseline differential mortality multiplier method. The 2009-2022 series are exclusively based on inheritance declarations ('net assets'), while the 2016-2022 series take into account 3-year pre-death gift history ('total transfer (3y)'). **Source:** Own calculations based on Statbel microdata and administrative inheritance and gift microdata.

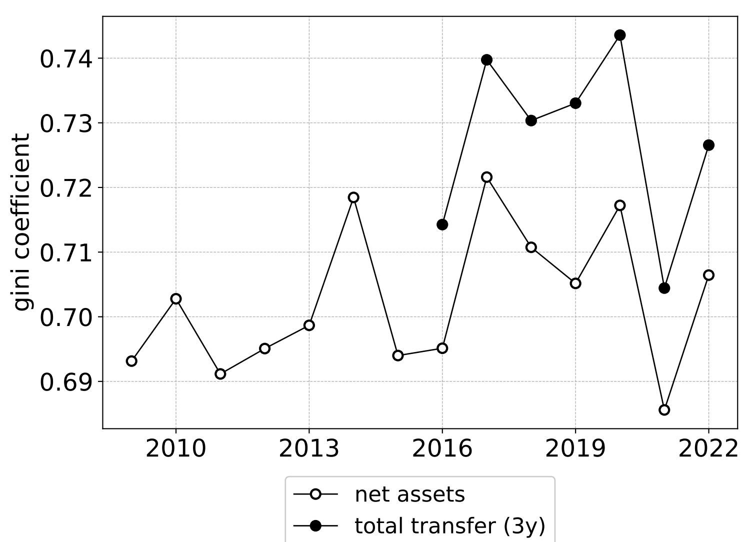


Figure 5: Baseline differential mortality multiplier gini coefficient estimates for Belgium, inheritance only and including gifts up to 3 years before death, 2009-2022. This figure depicts the evolution of gini coefficients estimated using the baseline differential mortality multiplier method. The 2009-2022 series is exclusively based on inheritance declarations ('net assets'), while the 2016-2022 series takes into account 3-year pre-death gift history ('total transfer (3y)'). **Source:** Own calculations based on Statbel microdata and administrative inheritance and gift microdata.

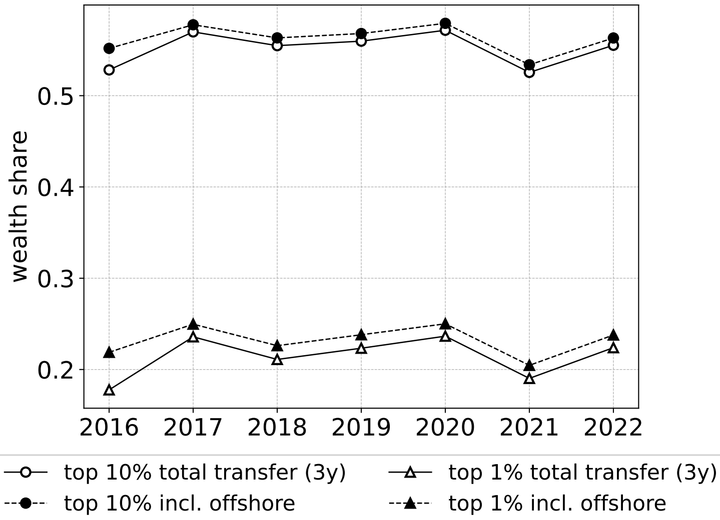


Figure 6: Baseline differential mortality multiplier top 1% and top 10% wealth share estimates for Belgium, including gifts up to 3 years before death and baseline correction for undeclared offshore wealth, 2016-2022. This figure depicts the evolution of net wealth shares estimated using the baseline differential mortality multiplier method. The series takes into account 3-year pre-death gift history ('total transfer (3y)') and corrects for estimated undeclared offshore wealth. **Source:** Own calculations based on Statbel microdata, administrative inheritance and gift microdata, and offshore wealth corrections are constructed from Alstadsæter et al. (2018, 2019) and Boas et al. (2024), see Appendix P for details.

of individuals together (Figure 4). The gini coefficient is on average around 0.73 (Figure 5). In all years, the bottom 50% of individuals hold less than 5% of net wealth (Figure 4, panel b).

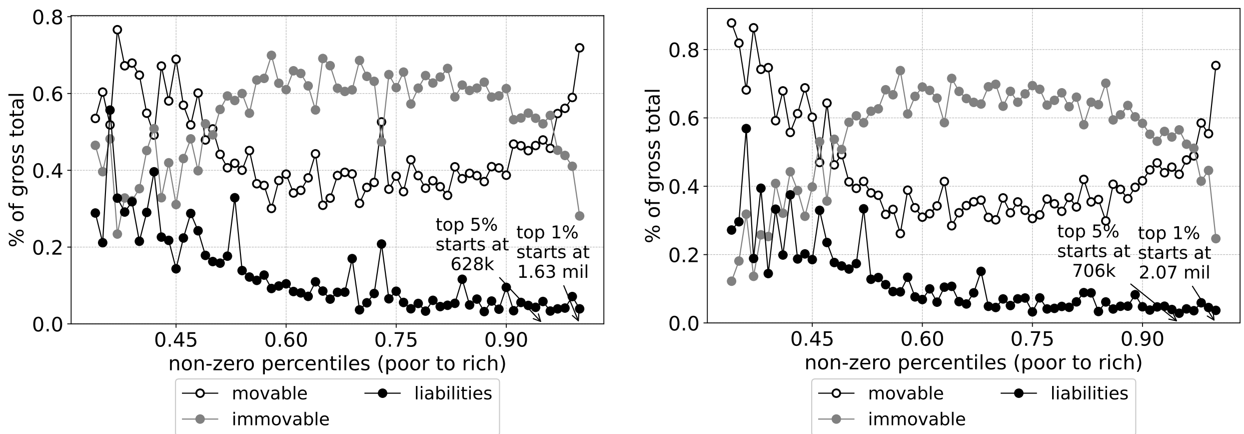
Correction for tax evasion. It is well-known that rich Belgian individuals avoid and evade inheritance taxation (Appendix C). One notable tax avoidance approach is transferring wealth to private foundations. Those private foundations appear to be rather unimportant in the aggregate and have a negligible impact on the distributional estimates (Appendix D).

Unfortunately, neither the federal tax administration nor Flemish tax administration have estimates about the size of gift and inheritance tax evasion.[33] However, tax evasion would only distort distributional estimates to the extent that it is differential over time and in function of inheritance size (Roine and Waldenström 2015). At the same time, there is evidence that offshore tax evasion is highly concentrated among the very rich (Alstadsæter et al. 2019) and may have declined substantially in recent years (Boas et al. 2024). Drawing on the available literature, I tentatively construct a distributional estimate which includes evaded offshore wealth. The baseline offshore wealth correction leads to a small upward revision in top wealth shares without changing the overall trend (Figure 6).[34] Alternative specifications and a detailed explanation of the applied correction are provided in Appendix P.

Regional wealth inequality. As weighting is done by region, regional wealth inequality can be estimated (see Figure S.6 in in Appendix S for detailed results). Wealth inequality is stable across

[33]Such estimates can be obtained through random audits of tax declarations.

[34]Only the gift-corrected distributional estimate is shown, as it does not make sense to apply a top correction to the inheritance-only series. As explained previously, the inheritance-only series no doubt underestimates wealth inequality.



(a) Inheritance only

(b) Including gifts

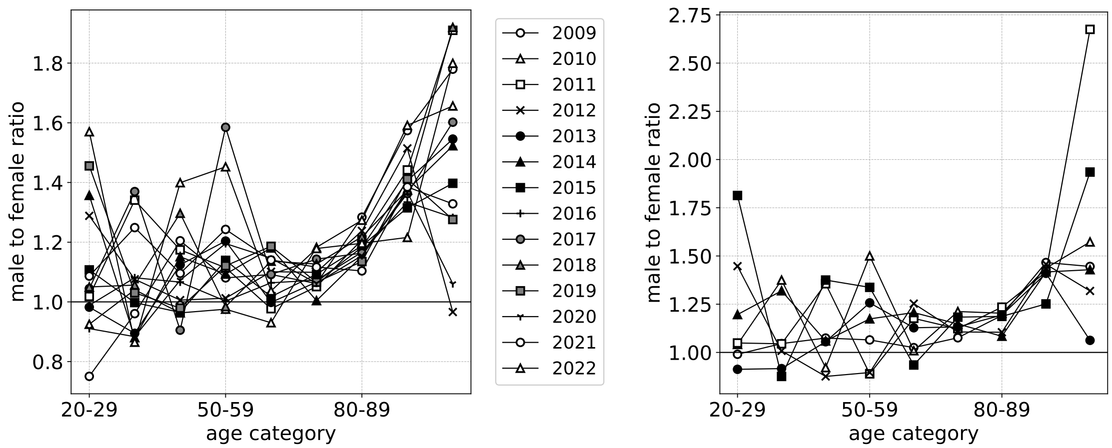
Figure 7: Asset decomposition for 2022 living adult population by percentile of net assets in movable and immovable assets and liabilities as a share of gross assets, only inheritance data (panel a) and including gifts up to 3 years before death (panel b), baseline differential weights. This figure depicts the asset composition by percentile for individuals with non-zero net wealth. The denominator consists of gross (i.e. without taking debt into account) assets (including gifts up to 3 years before death in the right panel). For the nominator, 'family business assets' (which are partially movable and partially immovable) are interpreted as movable assets. Allocating family businesses to the immovable category would have a negligible impact on the results, as family businesses (as an inheritance tax category) are even for the top 1% – relatively speaking – not too important in the inheritance flow. The decomposition takes place at the level of the percentile (rather than the average over individuals within a percentile). **Source:** Own calculations based on Statbel microdata and administrative inheritance and gift microdata.

all three regions, although there is more yearly variability in Brussels.[35] For the level of wealth inequality, Flanders seems quite similar to Belgium overall. In contrast, inequality is considerably higher in Brussels. For Wallonia, the inheritance-only series are roughly comparable to Belgium overall but the gift-corrected series point to a somewhat lower concentration at the top.

Asset composition along the wealth distribution. For rich upper middle class individuals, immovable assets make up a large proportion of total assets (Figure 7). However, at the very top of the distribution movable assets dominate. Liabilities fall as a proportion of total assets with increasing net wealth. Note that the bottom 30% of the distribution has zero or less net wealth (the data does not allow identification of decedents with negative net wealth, see Appendix F).

Gender. On average, men hold more net wealth than women across all age categories. Moreover, the difference is particularly large at older age (Figure 8). For younger age categories, the between-year variability in the average male-to-female ratio is higher. This higher variability is explained by the lower amount of decedents at younger age categories, which induces sampling variability. A decomposition of the share of men compared to the share of women by percentile leads to an interesting finding (Figure 9). While men are overrepresented at the absolute top of the distribution, women seem to dominate the middle.

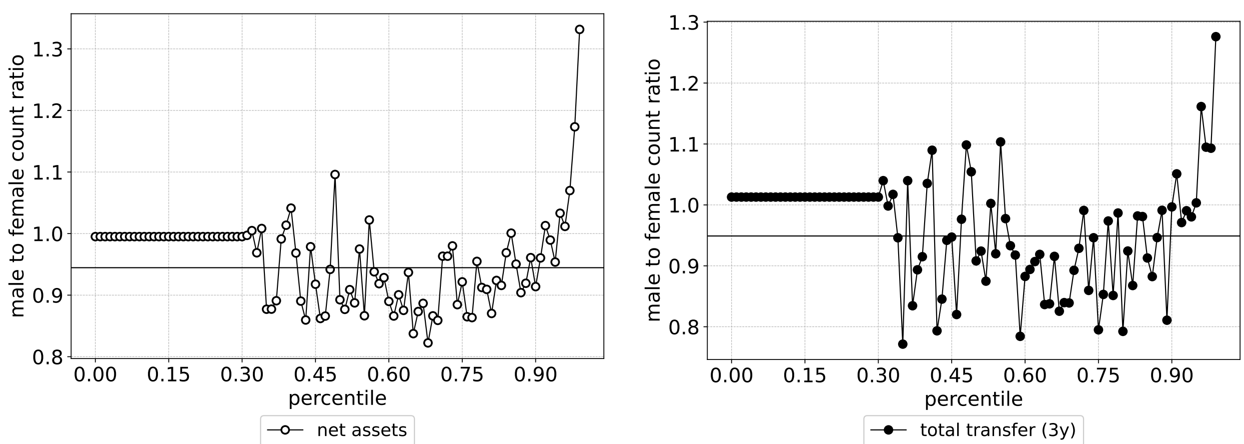
[35] Possibly due to sampling variability, as the annual number of deaths in Brussels is lower.



(a) Inheritance only

(b) Including gifts

Figure 8: Average net wealth of men relative to average net wealth of women across age categories, based on inheritance-only data (panel a) and including gifts up to 3 years before death (panel b), baseline differential weights. This figure depicts the average net wealth held by men at death relative to average net wealth held by a woman within each age category. **Source:** Own calculations based on Statbel microdata and administrative inheritance and gift microdata.



(a) Inheritance only

(b) Including gifts

Figure 9: Number of men divided by number of women per percentile, for inheritance-only estimates (2009-2022 average, panel a) and including gifts up to 3 years before death (2016-2022 average, panel b), baseline differential weights. This figure depicts the number of men in a percentile divided by the number of women in that percentile. The horizontal black line indicates the total number of men divided by the total number of women, across all percentiles. For zero net wealth observations, the average is calculated and plotted across all zero net wealth percentiles. **Source:** Own calculations based on Statbel microdata and administrative inheritance and gift microdata.

5 Triangulation

As mentioned, the mortality multiplier method comes with important limitations. Throughout this paper, robustness checks have been applied where it seemed appropriate to quantify the uncertainty surrounding the distributional estimates. An alternative approach to investigate the validity of the mortality multiplier approach is to compare the results with external data sources. If the estimates presented here and external data sources point to similar conclusions, then confidence in both the inheritance-based estimates and the external data sources increases. However, the reverse holds as well – if the estimates here differ notably from external data sources, then that is an indication that considerable uncertainty remains.

In the first part of this section I compare my results with national accounts aggregates. In a second part, I discuss previous wealth inequality estimates for Belgium.

5.1 National accounts aggregates

Here I investigate how the reweighted inheritance tax data are related to national accounts aggregates. In principle, if the reweighting is done correctly, then the rescaled observations should equal total private net wealth in Belgium.

The reliability of the national acounts data for aggregate private wealth varies by asset category. Financial variables in the national accounts tend to be based on mandatory counterpart reporting (i.e., financial intermediaries are by law obliged to directly report certain data to statistical institutes) (EGMM 2020). As a result, financial aggregates are considered highly reliable. For non-financial assets, the reliability of national account aggregates is lower since the value of these assets is estimated, and these estimates are sometimes criticised (e.g. Albers et al. 2022 for Germany). In Belgium, the National Bank estimates non-financial assets excluding land using the perpetual inventory method (PIM) (NBB 2014). The PIM-approach relates gross fixed capital formation with average service life, and assumptions of the dispersion around this average service life as well as the depreciation over time. The value of land is estimated using transaction data and cadastral information (NBB 2018). As discussed in Appendix Q, alternative estimates of the aggregate value of land and buildings are noticeably lower than the estimates in the Belgian national accounts.

As national accounts aggregates are not fully comparable with the reweighted inheritance data, I construct adjusted national account aggregates (see Appendix R for a detailed discussion).[36] For the inheritance tax data, I aggregate net wealth components into 'movable' and 'immovable' assets as well as 'liabilities'.

For the inheritance-only series (Figure 10), 53-70% of movable assets and 52-60% of immovable assets in the national accounts are captured. This finding is surprising as supposedly all immovable asset transfers should be registered (gifts of immovable assets are always registered). However, as mentioned, alternative estimates of aggregate immovable property value are substantially lower than in the Belgian national accounts (Appendix Q).

For the baseline series with gift correction (Figure 10), the fit with the national accounts improves

[36] The adjustment does not alter the national accounts valuation of immovable property.

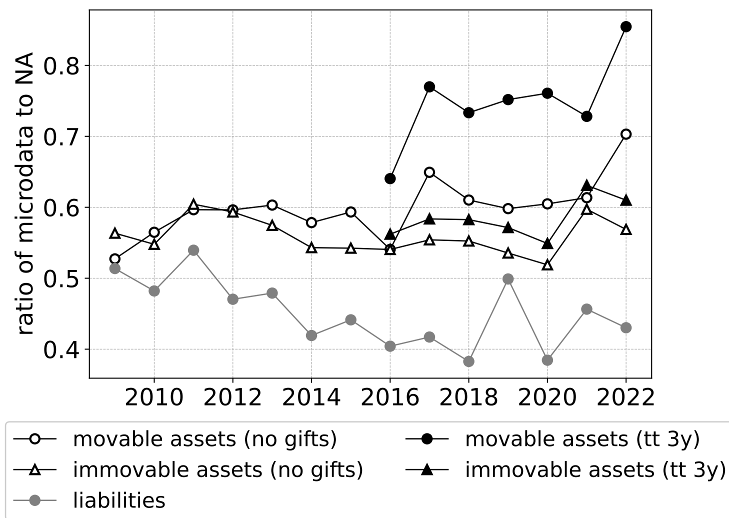


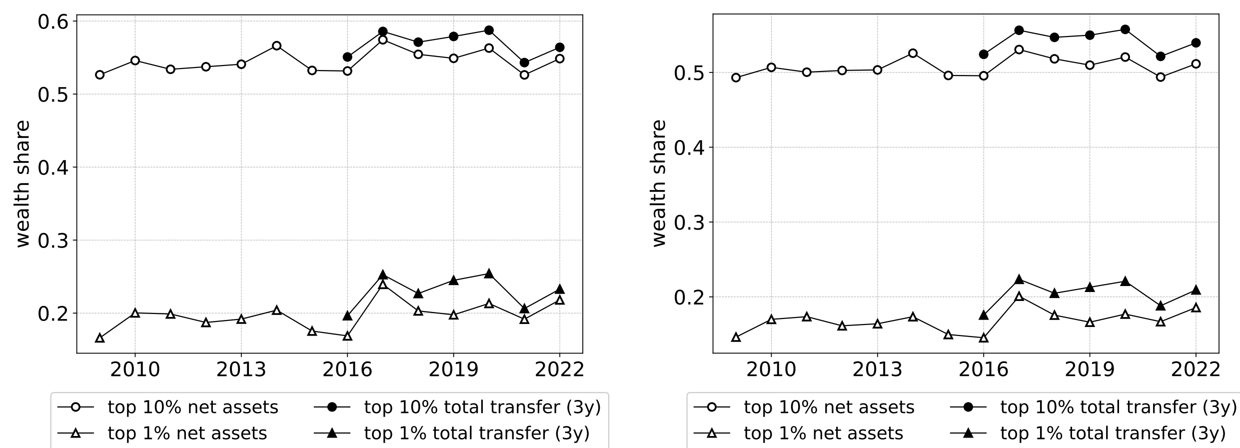
Figure 10: Aggregate net wealth implied by baseline differential reweighting relative to comparable national accounts aggregates, inheritance only and including gifts up to 3 years before death, 2009-2022. This figure shows the extent to which reweighted (gift-corrected) net inheritance data sum up to national accounts aggregates. The 2009-2022 series are exclusively based on inheritance declarations ('net assets'), while the 2016-2022 series take into account 3-year pre-death gift history ('total transfer (3y)'). **Source:** Own calculations based on Statbel microdata, NBB national accounts data, and administrative inheritance and gift microdata.

somewhat. Now, up to 85% of movable and up to 63% of immovable assets are captured. Once again movable assets are covered to a larger extent than immovable assets, while movable assets are likely not fully captured even in the gift-corrected inheritance tax data (due to tax avoidance and evasion).

A large part of liabilities is captured, between 38 and 54% of national account aggregates. It is not unsurprising that liabilities are only partially captured, given that loans covered by a corresponding life insurance are not recorded in the inheritance data. The share of mortgages in total liabilities increases over time (Figure S.7), which at least partially explains the declining coverage of liabilities in the reweighted microdata.

In the baseline series, children are excluded. Moreover, gift history is only incorporated up to 3 years pre-death. However, including children as well as the entire recorded gift history only marginally improves the fit with the national accounts aggregates (Figure S.8).

In order to check the robustness of the results, movable property, immovable property and liabilities have been rescaled to their national accounts counterparts. For movable and immovable property, rescaling has happened proportionally. For liabilities, the gap between the liabilities from the weighted microdata and the national accounts is allocated proportionally to immovable property, given that this gap is likely to predominantly consist of mortgage debts (as explained above). In an additional estimation run, rescaling takes place with respect to movable property and liabilities but not for immovable property, given the uncertainty around the reliability of immovable property valuation in the national accounts. Overall, rescaling does not seem to have a substantial impact on the results, although the series without immovable property rescaling shows slightly higher top shares (Figure 11).



(a) Partial rescaling

(b) Full rescaling

Figure 11: Baseline differential mortality multiplier top 1% and top 10% wealth share estimates for Belgium rescaled to movable property and liabilities (panel a) and all national account counterparts (panel b), inheritance only and including gifts up to 3 years before death, 2009-2022. This figure depicts the evolution of net wealth shares estimated using the baseline differential mortality multiplier method. In panel a, movable property and liabilities are rescaled proportionally to comparable national accounts counterparts. In panel b, rescaling additionally happens with respect to immovable property. The 2009-2022 series is exclusively based on inheritance declarations ('net assets'), while the 2016-2022 series takes into account 3-year pre-death gift history ('total transfer (3y)'). **Source:** Own calculations based on Statbel microdata, administrative inheritance and gift microdata, and NBB national accounts data.

In summary, it seems as if the reweighted inheritance data differ considerably from national accounts aggregates. These differences can plausibly be explained by comparability issues between both sources, possible valuation issues in the national accounts, and limitations of the inheritance tax data. However, reweighting to national accounts aggregates leads to highly similar distributional estimates. Hence, the mismatch with the national accounts may not be too concerning from a distributional perspective.

5.2 Previous wealth inequality estimates for Belgium and other European countries

Here I briefly relate my findings to the previous literature on Belgian wealth inequality and long-run estimates for other European countries. As mentioned, the inheritance-based approach is subject to sampling variability at the top and hence one should look at trends and levels across multiple years rather than at individual data points.

Belgian wealth inequality in the 20th century. Only three previous studies estimate Belgian wealth inequality in the 20th century. Frank et al. (1978) estimate Belgian wealth inequality at the household[37] level in 1969 by combining capital income tax data and budget surveys. Using a very similar approach, Rademaekers and Vuchelen (1999) estimate Belgian wealth inequality at the household level in 1984 and 1994.[38] In contrast, Alvaredo et al. (2024) estimate Belgian

[37]More precisely, at the level of the tax unit.

[38]From 1990 onwards, a change in the tax law makes it unreliable to use capital income tax data for financial assets. Rademaekers and Vuchelen (1999) correct for this by extrapolating earlier data.

wealth inequality at the individual level by applying the mean mortality multiplier approach to published inhertance tax tabulations.

There is a remarkable consistency between these previous studies and the baseline provided in this paper regarding the top 1% wealth share (Figure 12, panel a). The two capitalisation studies rely on completely different data sources and estimation approaches, but approximate both the level and the trend of the baseline inheritance-based series. To some extent, the small remaining gap between these studies and the baseline presented here may be due to the different unit of analysis (individuals in the inheritance-based series versus households in the capitalisation studies).[39] The estimates of Alvaredo et al. (2024) are somewhat higher than the baseline series, with a declining gap between both over the course of the 20th century. This gap is explained by the fact that I correct for net wealth of the non-included population[40], while Alvaredo et al. (2024) do not[41]. In addition, I correct for the fact that inheritance tax tabulations are from 1968 onwards by gross rather than by net assets. Given that liabilities are concentrated at the bottom of the distribution, this pushes up the wealth share of the top.[42]

For the top 10% wealth share, the capitalisation-based estimates indicate somewhat lower wealth concentration than the two inheritance-based series although the trend remains broadly similar (Figure 12, panel b). One should keep in mind that the inheritance-based series are less reliable for the top 10%, as the mean mortality multiplier method is only valid at the top of the distribution (Appendix B.2). Additionally, some of the difference may be due to the unit of the analysis (individuals versus households).

Belgian wealth inequality in the 21st century. In recent years, a growing number of scholars have studied wealth inequality across European countries, including Belgium, using HFCS survey data. Such survey data comes with two main limitations: (i) differential unit non-response (i.e. rich households are less likely to participate) and (ii) underreporting of wealth (i.e. households who do participate tend to undervalue their wealth). In a pioneering study, Vermeulen (2016) has proposed a solution for these issues through (i) replacing top survey observations with a Pareto correction using external information on rich households from rich lists and (ii) rescaling asset categories to national accounts aggregates. Similarly to capital income studies, survey-based studies are at the household level and are thus not entirely comparable to individual-level inheritance-based estimates.

There are two notable differences between my inheritance-based estimates and the previous literature for the 21st century (Figure 13).[43] First, the top 1% share found in Engel et al. (2022) and Kapeller et al. (2023) is higher than the top share in the inheritance-based series. Kapeller et al. (2023) do not correct the Belgian rich list they are using for family size, which might lead them to overestimate top wealth since their rich list observations will plausibly consist of multiple households.[44]

[39] An issue formally discussed by Atkinson (2007), who shows that top shares may be impacted by around 20% either way depending on the within-household distribution.

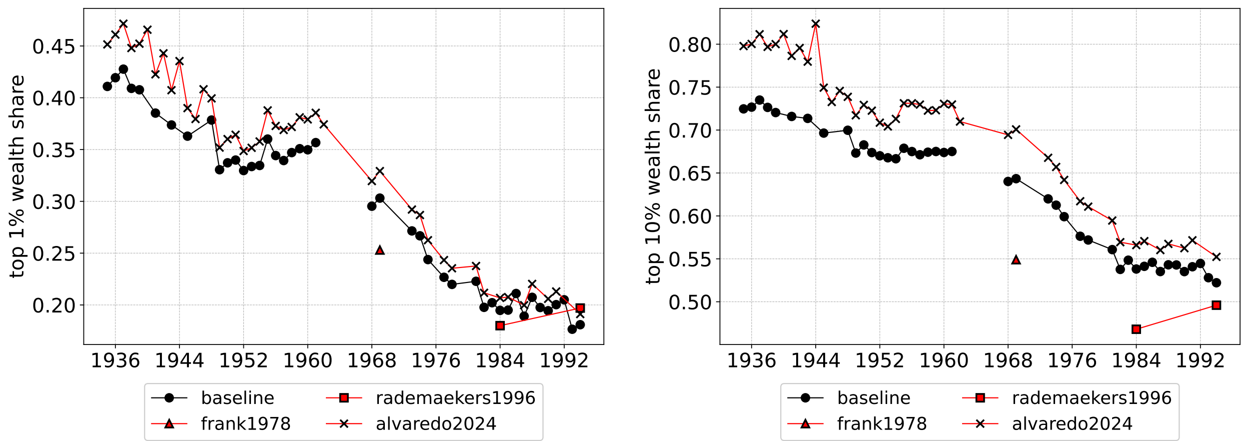
[40] Since historical sources indicate that their net wealth was non-negligible, see Section 3 and Appendix G.

[41] Although they mention that they ran a robustness check including a correction for net positive net wealth of the non-included.

[42] An estimation run where I assume that non-included decedents have zero net wealth and where I do not apply a gross-to-net correction from 1968 onwards is identical to the Alvaredo et al. (2024) estimates (see Appendix Figure S.9).

[43] I only compare with the gift-corrected series. It would not make sense to compare with the inheritance-only series, given that that series underestimates the actual top 1% wealth share.

[44] A rich list observation often refers to a family, which may consist of multiple households. Here one should keep



(a) Top 1% **(b)** Top 10%

Figure 12: Top 1% (panel a) and 10% (panel b) wealth share for Belgium in this and previous work, 20th century. This figure shows the evolution of the top 1% and 10% wealth share as estimated in this work and previous studies. Previous studies are Alvaredo et al. (2024), Frank et al. (1978), and Rademaekers and Vuchelen (1999). **Source:** Own estimates rely on Statbel microdata and inheritance and gift tax microdata. For other studies, see main text.

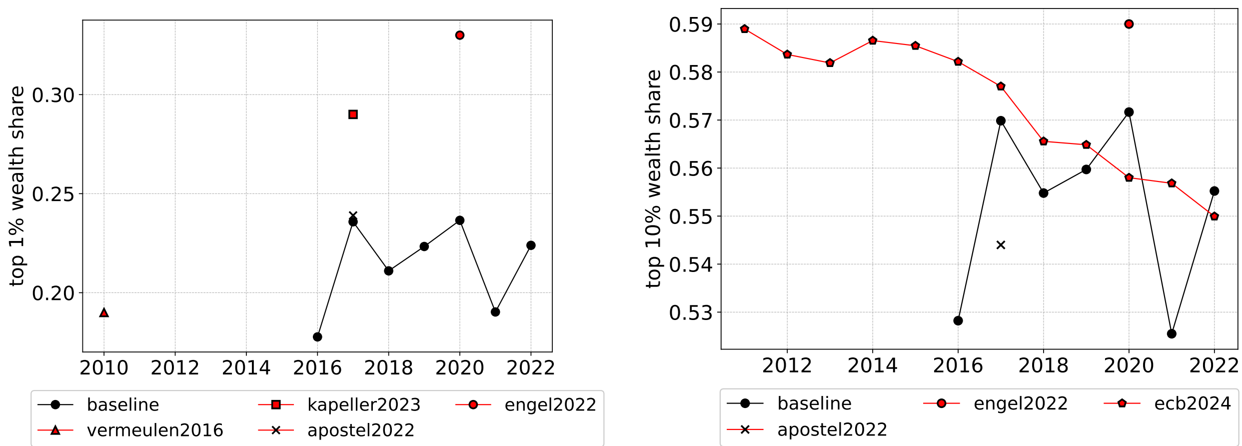
It is not immediately clear what causes the high top 1% wealth share found in Engel et al. (2022). One possible explanation is the fact that they impose external information regarding asset composition in the UK on the Pareto-imputed top before rescaling to national accounts aggregates. In addition, one might observe that the top 10% share in a recent paper building on their previous work (ECB 2024) is substantially lower than the top 10% share found by Engel et al. (2022), although it is not clear what explains these revisions in top wealth shares estimates.[45]

A second notable difference is that the ECB (2024) top 10% estimate declines over time. In contrast, the inheritance-based series do not provide evidence for either a decline or a rise in Belgian wealth inequality: averaging over the 3 first years (2016-2018) and the 3 last years (2020-2022) in the 21st century inheritance-based series to correct for sampling variability leads to the same average top 10% share of 55%. The stable trend in the inheritance-based series appears to be very robust to the weighting procedure and the applied corrections, as mentioned throughout Section 3.2 and Section 4.2.

There are some estimates of Belgian wealth inequality which I exclude on methodological grounds. Most notably, the World Inequality Database (WID) publishes annual Belgian wealth inequality estimates for 1995-2022 (Blanchet and Martínez-Toledano 2022) using HFCS-data rescaled to the national accounts. WID series extrapolate beyond HFCS survey years by assuming constant portfolio composition by percentile, and rescaling to national accounts aggregates for each year. In contrast to other survey-based studies, the WID series is at the individual level. In the WID approach household wealth is allocated equally among adult household members, which will (at least somewhat) underestimate wealth inequality. Blanchet and Martínez-Toledano (2022) esti-

in mind that Kapeller et al. (2023) focus on the EU as a whole, which poses different challenges than country-specific studies.

[45]Here one should keep in mind that they implement a cross-country analysis and label their own results as experimental. Unfortunately, ECB (2024) do not make their top 1% wealth share publicly available. The authors do not share the code underlying their estimates, so it is not possible to investigate this further.



(a) Top 1%

(b) Top 10%

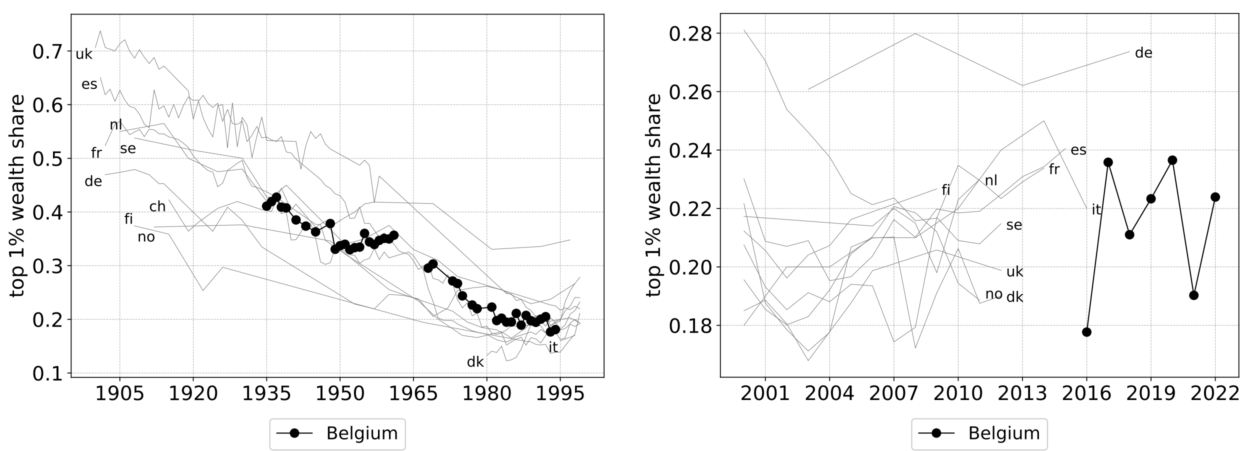
Figure 13: Top 1% (panel a) and 10% (panel b) wealth share for Belgium in this and previous work, 21st century. This figures show the evolution of the top 1% and 10% wealth share as estimated in this work and previous studies. Previous studies are Apostel and O'Neill (2022), ECB (2024), Engel et al. (2022), Kapeller et al. (2023), and Vermeulen (2016). Not all of these studies report on both the top 10% and the top 1%. All availble data is plotted. **Source:** Own estimates rely on Statbel microdata and inheritance and gift tax microdata. For other studies, see main text.

mate that the top shares have declined slightly in the 21st century, with the top 1% holding 18% of net wealth in 1995 and 15% in 2022. However, the WID estimates might not be fully reliable for top wealth shares in Belgium. It is well established that wealth surveys do not capture very wealthy households (e.g. EGMM 2020), and the WID estimates for Belgium do not correct for this.[46]

Overall, the inequality level of the baseline inheritance-based series is roughly in line with the inequality level found in previous survey-based studies. As these survey-based studies rely on completely different data sources and assumptions, this heightens confidence in the general level of wealth inequality implied by this paper and previous work. At the same time, the present study sheds doubt on the declining top wealth shares reported by the ECB (2024) and WID (Blanchet and Martínez-Toledano 2022). In fact, the stable trend in the inheritance-based series appears to be highly robust.

Comparison with other European countries. Throughout both the 20th century and the 21st century, it seems as if Belgian wealth inequality is similar in both level and trend to other European countries (Figure 14). Estimates from other countries are based on different methods and come with different limitations, so a cross-country comparison assumes that trends and levels are nonetheless roughly comparable.

[46]In this regard, one should note that WID estimates are constructed using consistent cross-country procedures, whereas for specific countries more suitable context-dependent estimation approaches might be preferable.



(a) 20th century

(b) 21st century

Figure 14: Top 1% wealth share for Belgium and other European countries, 20th century (panel a) and 21st century (panel b). These figures show the evolution of the top 1% wealth share in Belgium and other European countries for which such data is available. These other European countries are France (fr), Spain (es), the United Kingdom (uk), Germany (de), Sweden (se), Denmark (dk), Italy (it), Switzerland (ch), Norway (no), Finland (fi), and The Netherlands (nl). These estimates were brought together by Waldenström (2024) and are downloadable on his personal site. For a graph where non-Belgium countries are labelled as well as the original source for each country, see Figure S.10. **Source:** Belgian estimates based on own calculations based on HMD microdata and inheritance tabulations. For other countries, see Figure S.10.

6 Conclusion

In the absence of a wealth register, Belgian wealth inequality needs to be estimated. Three estimation approaches are possible: (i) wealth surveys; (ii) capitalising capital income tax data; (iii) reweighting inheritance tax data. Unfortunately, the only available Belgian wealth survey starts in 2010 and, as is the case for most survey-based wealth inequality research, suffers from differential unit non-response and underreporting of wealth. Moreover, due to tax law changes, the capital income tax approach cannot be applied to recent years. In contrast, inheritance tax data is available from 1935 onwards. Furthermore, inheritance-based estimates can be compared with results from studies using completely different data sources and estimation approaches, thus heightening or diminishing their reliability. In addition, the Belgian inheritance tax system has high to almost complete coverage, which makes it especially suitable to estimate wealth inequality.

This paper uses inheritance tax data to estimate Belgian wealth inequality. For 1935-1994, publicly available inheritance tax tabulations are available. For 2009-2022, inheritance tax microdata could be used, linked to gift tax data and detailed sociodemographic information. There are two main methods to estimate wealth inequality from inheritance tax data. The first method allocates a weight to each decedent to render the weighted inheritance tax data representative of the living population (*differential mortality multiplier method*). The second method allocates the same weight to each decedent in a given year (*mean mortality multiplier method*), as recent research has shown that top shares of the wealth distribution are well approximated by top shares of the (unweighted) inheritance distribution. While the differential multiplier method is no doubt more precise, the mean mortality multiplier method has lower data requirements.

The main findings are as follows. Belgian wealth inequality has decreased during the 20th century and seems to be neither increasing nor decreasing in the 21st century. For 2022 the estimated top 1% wealth share is around 22%, about as much as the bottom 75% of individuals combined. Wealth inequality in Flanders seems comparable to wealth inequality in Belgium overall, whereas wealth inequality may be higher in Brussels and lower in Wallonia. At the top of the distribution, movable assets dominate the asset composition. On average, men hold more net wealth than women across all age categories. This gender wealth gap is especially pronounced at older age. A decomposition reveals that men are overrepresented at both the bottom and the top of the wealth distribution, with women being overrepresented at the middle.

Throughout this paper, important data limitations have been emphasised. To the extent possible, robustness checks and triangulation have been applied. Using recent microdata, key assumptions of the mean mortality multiplier approach have been validated. The differential mortality multiplier method has been applied using three different weighting schemes, and the results appear robust to the weighting procedure. Taking into account gross taxable wealth in private foundations or plausible offshore wealth estimates does not seem to have a substantial impact on the distributional estimates. While aggregated assets and liabilities differ from their national account counterparts, rescaling does not alter the main conclusions of the analysis. The level and trend of the inheritance-based estimates are in line with previous estimates for the 20th century. However, the present study sheds doubt on some findings in previous work for the 21st century. In particular, it may not be the case that Belgian wealth inequality has declined in recent years. Lastly, the results of this paper are in line with the evolution of wealth inequality in other European countries.

While focusing on wealth inequality, the analysis presented here has broader implications. For example, I document substantial variation across estimates of the aggregate value of Belgium's immovable property stock in recent years. Moreover, private foundations may be less important for tax avoidance than has been suggested in public debate, as gross taxable wealth in such foundations is negligible in the aggregate.

This paper additionally contributes to the literature on mortality multiplier wealth inequality measurement. Previous studies tend to approach weighting crudely, due to data constraints. Here sociodemographic information was available at the microlevel, which allowed for considerably more precise reweighting. Moreover, the paper innovates methodologically by using a machine learning approach in one of the weighting specifications. This machine learning approach imposes less structure on the weights, and is thus able to provide a more data-driven estimate of the wealth distribution. Lastly, the precise differential weights applied provide broadly favourable evidence for the validity of the recently proposed mean mortality multiplier approach.

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Appendix A: An extended discussion of wealth transfer taxation in Belgium

In this Section, the main characteristics as well as the evolution over time of wealth transfer taxation in Belgium are discussed. A basic overview of the Belgian wealth transfer tax system is required to have a good understanding of the data underlying the estimation procedure. The Belgian wealth transfer taxation system is complex, containing many exemptions and reductions that are left undiscussed here.[47]

Movable and immovable assets. The difference between movable and immovable assets is crucial for Belgian wealth transfer taxation, as these categories are treated differently in the gift tax system and to a lesser extent also in the inheritance tax system. Immovable assets consist of land, buildings, and rights on land and buildings. All other assets are classified as movable.[48]

Succession law. Since 1919, in principle the entire estate of persons whose de facto main residence is situated in Belgium at the time of their death are subject to inheritance taxation (De Reu 2009, 2011).[49] Valuation is at market value, while liabilities at death and funeral costs are subtractable (Van Acoleyen 1978). Unregistered[50] gifts up to 3 years before death are considered to be part of the estate for tax purposes (Donnay 1948).[51]

Tax rates differ by degree of kinship and by the value of the inheritance. Overall, there has been a gradual increase in nominal tax rates during the 20th century (De Ryck 1988; Pacolet and Van De Putte 2000; Van Acoleyen 1978).[52]

Since at least 1933, there is small exemption for direct descedents and spouses with common descedents.[53] This exemption was increased in 1947, 1953, 1967, and 1978 (Van Acoleyen 1978). From 1967 onwards, spouses without children can also enjoy this exemption (Van Acoleyen 1978). There is an additional exemption for underage children, but its relevance is negligible (Frank 1973; Ministry of Finance 1973). For very small estates, there is an exemption for inheritors that are neither direct descedents nor spouses (Van Acoleyen 1978).

In 1959 the post-death inheritance declaration period was narrowed slightly (De Reu 2015). From 1919 onwards, an inheritance declaration had to be filed within 6 months if the decedent died in Belgium, 7 months if the decedent died in Europe, and 8 months if the decedent died outside of Europe. Starting in 1959, this period became 5 months, 6 months, and 7 months respectively.

In 1980, the tax rate on sole proprietor companies was lowered moderately (De Greef 2015).

[47] Exempted and reduced assets are in principle still registered at their total market value in the inheritance and registered gift tax data. An inheritance tax declaration is also required if the deceased person had net liabilities or if the inheritance is fully exempted (Donnay 1948).

[48] There are some exceptions, e.g. paintings that are incorporated in a wall or furniture in a furnished student room are considered immovable as well. See Wylleman and Baeck (2023) for a detailed discussion.

[49] Before 1919, inheritance taxation applied only to certain assets and certain receiver categories.

[50] Unregistered gifts are gifts which are not officially registered and on which no gift tax is thus due, see below for a further explanation.

[51] Since 1913 (Donnay 1948). Note that in Wallonia this period has been heightened to 5 years from 2022 onwards (Bourgeois and Zee 2022).

[52] For an overview of tax rate changes in the first half of the 20th century, see Genin (1950).

[53] See article 54 of the Royal Decree of 7 April 1936 on the establishment of the Inheritance Tax Code.

Succession law has been regionalised since 1989 (Decoster et al. 2009).[54] Since then, the place of fiscal residence determines which regional tax system is applicable (Delanote 2022). There have been numerous changes in inheritance tax law across regions, the most important of which are mentioned below.[55]

From 1997 onwards, the inheritance tax system was reformed in Flanders (SERV 2010). Most notably and only in Flanders, since 1997 'movable' and 'immovable' property are taxed according to the same tariffs but separately, implying a large tax cut for inheritances made up of both movable and immovable property (Verdonck 2009).[56] In addition and again only in Flanders, the tax exemption system was reformed substantially (Deblauwe 1997). The main change consists of transforming the exemption for direct descedents and spouses to a tax credit applicable only on inheritances below a certain threshold.

Across regions, inheritance tax rates on businesses were substantially lowered.[57] In Flanders the tariff on businesses was lowered to 3% in 1997 and businesses became completely exempt of inheritance taxation in 1999 (Sansen 2011). In 1998-1999, the tax rate on businesses was similarly lowered in Wallonia and in Brussels to 3% (Bogaerts 1999). In 2005, Wallonia introduced a 0% tarif on business succession to a spouse, child, or employee. In 2006, Wallonia further broadened this measure by implementing a 0% rate for all business successions (Verdonck 2009). In 2012, Flanders changed its preferential treatment of business succession by replacing its full exemption with a flat rate of 3% for direct descedents and 7% for all others (Biesmans and Deblauwe 2012).

All three regions abolished the legally different treatment of (i) non-married but legal cohabitants and married couples, and (ii) own children and children of a spouse from a previous relationship in 2001-2003 (Verdonck 2009).

The inheritance tax on the family home was also lowered considerably. In 2003, Brussels lowered the tax rate on the family home. Wallonia mimicked this measure in 2006, and Flanders exempted the surviving spouse from inheritance tax on the family home in 2007 (Verdonck 2009).

An important aspect of Belgian succession law is the presence of a number of 'legal fictions'. A legal fiction is a rule that states that a certain asset is considered to be part of the estate for inheritance tax purposes even though it is in a strict legal sense not part of the estate. As is clear from the descriptions below, these legal fictions close off potential tax avoidance routes. The main legal fictions are (Delanote 2022; Donnay 1948)[58]:

- *Liabilities acknowledged at death (i.e. in a person's will) (from 1851 onwards), gifts disguised as liabilities (from 1913 onwards), and gifts of movable property conditional on the donor's death (from 2004 onwards)*[59]. In the first two cases, these 'liabilities' are plausibly not liabilities and should

[54] In fact, the Belgian regions were able to set tax rates, exemptions, and tax reductions from 1989 onwards. In 2001 there was an additional regionalisation related to the definition of the taxable basis.

[55] For a comprehensive overview of the changes until 2007, see Verdonck (2009).

[56] The stated reason for this split was to encourage tax payers to disclose more movable property, since declared movable property is easier to invest (as it is legally obtained) than undeclared movable property (Deblauwe 1997).

[57] These preferential schemes are subject to a number of conditions (e.g. relating to minimal employment and minimal ownership shares).

[58] The list I am giving here is a summary, for a detailed discussion see Delanote (2022). These legal fictions differ somewhat across regions and over time. In addition to the legal fictions mentioned, there is also a legal fiction that pertains to the distribution of the fiscal burden based on obligations in a person's will.

[59] Before 2004, registered gifts were taxed at similar rates to inheritances and so this only became a potential tax

thus be taxed. In the latter case, the gift does not take place until the donor's death and is thus plausibly an inheritance and not a gift.

- *Unequal distribution of the shared marital property conditional on the donor's death (from 1851 onwards).* Legally, 'marital advantages' are not considered to be gifts and are not subject to inheritance taxation. By considering all net assets allocated to the surviving spouse conditional on the other spouse's death as a fictional part of the estate, this route for tax avoidance is closed.

- *Unregistered gifts of movable property up to 3[60] years before death (from 1913 onwards).* As mentioned, unregistered gifts of movable property are subject to inheritance taxation.

- *A cost-free clause benefiting a third party conditional on the decedent's death, including life insurance policies (from 1913 onwards).* Life insurance on mortgages is excluded from this legal fiction since such stipulations are meant to compensate for a delivered performance (and are thus not cost-free from the perspective of the third party). In the case of mortgages, the covered liabilities are likewise excluded from the estate.

- *Aquisitions where usufruct is allocated to the decedent and bare ownership to a third party (from 1919 onwards).* This third party should be a beneficiary of the estate, or a person related to a beneficiary.

- *Partitions with allocation of a lifelong right in exchange for full ownership (from 1919 onwards).* The involved third party should be a beneficiary of the estate, or a person related to a beneficiary.

- *Gifts disguised as property sales with retention of a lifelong right (from 1919 onwards).* The involved third party should be a beneficiary of the estate, or a person related to a beneficiary.

Gift law. Only gifts registered in Belgium are subject to gift taxation. Immovable property situated in Belgium can only be gifted with registration in Belgium (and is thus always subject to transfer taxation). Gifts of immovable property situated outside Belgium are not subject to Belgian gift taxation. Movable property can be gifted without registration to some extent.[61] For example, deposits or shares held through a securities account can be gifted tax free if unregistered.

In 1933 gift tax rates were heightened considerably to bring gift taxation in line with inheritance taxation and reduce avoidance opportunities (Hardewijn 1999). In 1939, progressive gift tax rates were introduced to bring gift taxation fully in line with inheritance taxation (De Ryck 1988; Genin 1950; Werdefroy 1964).[62]

In 1999, tax rates on gifts of businesses were lowered to 3% (Sansen 2011).

Gift law was regionalised in 2002 (SERV 2010). Note that up to and beyond this point, gifts were still taxed according to pre-regionalisation federal succession-like tax rates (Pacolet and Van De Putte 2000; SERV 2010).

avoidance route in recent years.

[60] From 2022 onwards, 5 years in Wallonia.

[61] Unregistered gifts of movable property are subject to inheritance taxation if the donor dies within 3 years (Flanders and Brussels) or since 2022 5 years in Wallonia (Bourgeois and Zee 2022). For unregistered gifts of businesses and since 2012, the gift should take place 7 years before death in Flanders (Bourgeois and Zee 2022).

[62] Similarly to inheritances, gifts of up to three year before the current gift were taken together (otherwise tax payers would optimise taxation by splitting up gift registrations), see Special Powers Decree nr 9 5 July 1939. However, as mentioned, unregistered gifts of movable property have never been subject to taxation.

All regions eventually abolished gift tax rates on businesses.[63] In 2003, Flanders lowered the tax rate on gifts of businesses to 2% (De Greef 2015). In 2005, Wallonia introduced a 0% tarif on business gifts to a spouse, child, or employee. In 2006, Wallonia further broadened this measure by implementing a 0% rate for all business gifts (Verdonck 2009). In 2012, Flanders introduced a 0% tax rate on business gifts (De Greef 2015). In 2017, Brussels also introduced a 0% tax rate on business gifts.

All three regions abolished the legally different treatment of non-married but legal cohabitants and married couples in 2003-2004 (Verdonck 2009). In 2004 Flanders abolished the legally different treatment of adopted and biological children, while in 2006 Wallonia abolished the legally different treatment of own children and children from a spouse from a previous relationship (Verdonck 2009).

In 2004, Flanders aggressively lowered the tax rate on gifts of movable property. As a result, the associated Flemish tax revenue increased by 450% in 2005 compared to 2003. Brussels and Wallonia implemented a similar reform near the in 2005 and 2006 respectively, which led to substantial increases in tax revenue in both regions.

From 2015 onwards, the tax rate on gifts of immovable property was lowered in Flanders, with the explicit reason of encouraging such gifts and increasing short-term government revenue. From 2016 onwards, the tax rates on immovable property gifts in Brussels were lowered to mimic the Flemish rates. In 2017, the Walloonian tax rates on immovable property gifts were lowered somewhat, but this lower tax rate did not induce heightened property gifts (in contrast to Flanders and Brussels). In 2018, the Walloonian tax rates were lowered to similar levels as in Flanders.

Since 15/12/2020, foreign gift registrations should always be registered in Belgium as well and are thus subject to gift taxation (Bossuyt 2022; Bourgeois and Zee 2022). Previously, rich Belgian households tended to avoid gift taxation on movable property by using Dutch notaries for their registration. For gifts of immovable property (i.e., real estate), registration in Belgium was already mandatory, as mentioned above.[64]

Evolution of gift and inheritance flows. Data on inheritance and gift tax revenues are available annually from 1965 onwards (see Figure A.1 below). Since 1965, there is a strong increasing trend in inheritance tax revenues. Interestingly, gift tax revenues only increased from 2004 onwards. As gift tax rates were lowered substantially, the implied increase in registered gift flows is even higher than what one would surmise from the gift tax revenue trend. An important implication of this observation is that registered gift flows only seem to matter (relative to inheritance flows) from 2004 onwards.[65] Notably, 2008-2009 gift tax revenue declined again to varying degrees in all three regions (SERV 2010). From 2010 onwards, gift tax revenues are on an upward trajectory.

[63] These preferential schemes are subject to a number of conditions (e.g. relating to minimal employment and minimal ownership shares). Note that those tax-free registered gifts are included in the data, and that valuation of the gift is a formal requirement (and thus also available).

[64] Of course, movable property can still be gifted tax-free if not registered.

[65] But note that Vuchelen (1978) argues that gifts are more concentrated at the top than inheritances (without empirical evidence for Belgium).

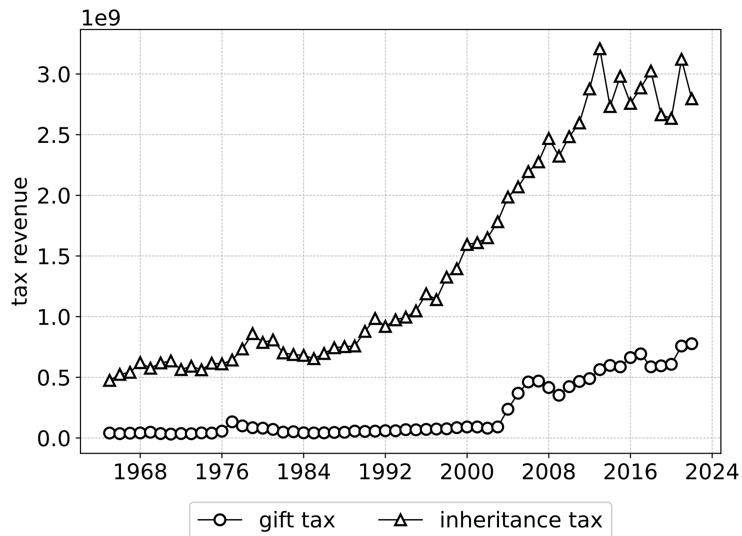

Figure A.1: Evolution of Belgian wealth transfer tax revenues over time, 1965-2022 (constant 2022 euros). This figure depicts the inflation-corrected revenue of inheritance and gift taxation in Belgium (consolidated across all regions). Values are deflated using a GDP price index. **Source:** OECD Revenue Statistics, accessed on 21/02/2024 (variable codes: 4310 Estate and inheritance taxes and 4320 Gift taxes). The deflator is from WID.world, accessed on 02/08/2024 (variable code: inyixx999i).

Appendix B: The mortality multiplier approach

In this Appendix, the differential mortality multiplier approach is shortly explained, followed by an important finding from previous research: using differential weights may not have that much impact on top wealth share estimates (the mean mortality multiplier approach).

B.1 Explanation of the differential mortality multiplier approach

The differential mortality multiplier approach is a method to estimate wealth inequality from estate data of deceased persons. As mentioned in Atkinson and Harrison (1978), the method was invented by Mallet (1908), who applied it to British estate tax data. The exposition of the mortality multiplier approach provided here closely follows Berman and Morelli (2021) and Acciari et al. (2024).

The starting point of the mortality multiplier approach is the estate distribution in a particular year. Specifically, the total value of the estates in that year W_E equals

$$W_E = \sum_{i=1}^{N_E} w_{E,i},$$

with N_E equal to the number of deaths in that year and $w_{E,i}$ the net estate value of deceased person i.

Mortality rates differ among age, gender, and socioeconomic status[66] (e.g. Blanpain and Chardon 2011; Marmot 2016). In demographic research, socio-economic status tends to be conceptualised as consisting of (i) educational background, (ii) employment characteristics, and (iii) income/wealth (Eggerickx et al. 2018b; Van Hemelrijck et al. 2016). Additionally, (iv) housing characteristics are sometimes considered relevant either in themselves or as an indicator of material resources (Galobardes 2006a). Moreover, there has been a long-standing recognition that (v) area-level characteristics may have some mortality effect independent of individual socio-economic characteristics (Galobardes 2006b; Otavova et al. 2023).[67]

There is a somewhat extensive body of demographic work on differential mortality rates among the Belgian population. Previous research has found differences in mortality rates related to gender (e.g. Gadeyne 2006), educational attainment (e.g. Deboosere et al. 2009), employment characteristics (e.g. De Moortel et al. 2018), housing characteristics (e.g. Damiens 2020), and region[68] (e.g. Renard et al. 2017). Moreover, there is some evidence that Belgian mortality rate inequality is increasing over time due to higher gains in life expectancy among the most advantaged groups (e.g. Deboosere et al. 2009; Renard et al. 2019).

[66] With regards to socioeconomic characteristics, it may be the case that individual (lifestyle) or structural differences related to socioeconomic circumstances lead to higher mortality risks. On the other hand, negative health shocks may induce negative socioeconomic effects (Gadeyne and Deboosere 2002).

[67] In the demographic literature, a distinction is made between (i) compositional, (ii) collective, and (iii) environmental living area mortality effects (Otavova et al. 2024). Only the first effect is completely captured by individual-level sociodemographic variables.

[68] Even after controlling for socio-economic variables, see Deboosere and Gadeyne (2002) and Van Hemelrijck et al. (2016).

In summary, the mortality rate of a deceased person depends on the sociodemographic group to which that person belongs. Based on this observation, total wealth among the living in that year W can be obtained as

$$W = \sum_{i=1}^{N_E} m_i w_{E,i}, \tag{1}$$

where the mortality multiplier $m_i \equiv 1/p_i$ with p_i equal to the mortality rate of the sociodemographic group to which the deceased person i belongs. In other words, each deceased individual represents a certain number of living persons (with the number given by the mortality multiplier applicable to that individual).

An example may clarify the differential approach. Suppose there is a society consisting of 3 age-gender-socioeconomic-status groups. Group 1 consists of 100 individuals, group 2 consists of 200 individuals and group 3 consists of 300 individuals. The wealth of these individuals is not directly observed. Further suppose that in a certain year 10 individuals randomly die in each of these groups, and that wealth at death is observable. The distribution of wealth at death may not correspond to the distribution of wealth among the living, given that the probability of an individual to die differs by group. For example, an individual in group 1 is 3 times as likely to die as an individual in group 3 (10/100 versus 10/300). However, if one can identify these groups in both the living and the death population, it becomes possible to correct for this difference in sampling probability. This correction consists of attaching a weight to each individual. In the example, a decedent beloning to group 1 would get a weight of 10, a decedent belonging to group 2 a weight of 20, and a decedent belonging to group 3 a weight of 30. The distribution of wealth among this weighted sample is then a good approximation of the distribution of wealth among the living.

To retrieve top wealth shares, one can rank the deceased persons in descending order based on their net estate such that $w_{E,i} \geq w_{E,j}\ \forall i < j$. Suppose one is interested in the top q quantile share. One should then first select the deceased persons that represent the top q quantile of the living population. Specifically, this is done by summing over the mortality multipliers associated with each deceased person, starting at the top of the distribution, until this sum equals the number of living individuals in the top q quantile. The resulting set of deceased persons will correspond to the top q living population. In a next step, the top q wealth share is obtainable by summing over the individual-by-individual product of net estate and mortality multiplier for the selected group of deceased persons. Other statistics of interest (e.g. bracket shares) are easily obtainable along similar lines.

B.2 The mean mortality multiplier result

Going back to Atkinson and Harrison (1978), there is evidence that the actual impact of 'differential mortality multipliers' (i.e. differential weights by age, gender, and social background) is relatively small for top wealth shares (Alvaredo et al. 2018). In other words, the share of wealth held by the richest x% living individuals is close to the share of total estates held by the richest x% decedents. Alvaredo et al. (2024) show that this finding is an empirical regularity, finding evidence for it in Australian, French, Italian, South Korean, UK, and US data.

In what follows I first reproduce the analytical framework of Alvaredo et al. (2024). I then discuss the interpretation of their framework and the relevance of their approach. Next, I check the validity of the mean mortality multiplier method for Belgium using the 2009-2022 microdata. In the last part I provide the formal derivation of the main analytic result in Alvaredo et al. (2024).

B.2.1 Analytical framework

Here I reproduce the analytical framework for the mean mortality multiplier method put forward by Alvaredo et al. (2024). The notation here is consistent with their notation, as well as with the notation above.

Definitions. Define the differential mortality multipliers as $m_i \equiv 1/p_i$ with p_i the probability to die of an invidual with the same characteristics as decedent i. m_i then gives the number of living individuals represented by that decedent i. The mean mortality multiplier is defined as the average multiplier across all decedents, i.e. $\bar{m} = \frac{1}{N_E}\sum_{i=1}^{N_E} m_i = \frac{N}{N_E}$ with N the total living population and N_E the total number of decedents.

Net wealth of decedent i is denoted by $w_{E,i}$. Suppose that deceased persons are ranked in descending order based on their net estate such that $w_{E,i} \geq w_{E,j}\ \forall i < j$.

Then define I_q as the number of decedents one requires to represent the top q $(0 < q < 1)$ quantile of the living population in the differential approach. Formally, $\sum_{i=1}^{I_q} m_i = q\,N$.

Define W as total aggregate wealth held by the living.[69] It is now possible to define the wealth share held by the top q quantile of the living population as estimated by the **differential mortality multiplier method** in the following way

$$Sh_q^W \equiv \frac{\sum_{i=1}^{I_q} m_i\, w_{E,i}}{W} \tag{2}$$

Similarly, define the wealth share held by the the top q quantile of the living population as estimated by the **mean (or simplified) mortality multiplier method** as

$$Sh_{q,\text{simp}}^W \equiv \bar{m}\,\frac{\sum_{i=1}^{qN_E} w_{E,i}}{W} \tag{3}$$

Note that in the mean approach the top q quantile of the living population $(q\,N)$ is always represented by the top q quantile of decedents $(q\,N_E)$, which makes sense given that each decedent observation gets allocated the same weight.

Decomposition. For the mean mortality multiplier method to be valid, it should yield the same result as the differential mortality multiplier method. To understand under which conditions validity applies, Alvaredo et al. (2024) decompose the difference between the top shares estimated using each method in the following way

$$Sh_q^W - Sh_{q,\text{simp}}^W = \frac{I_q}{W}\left[\bar{m}_{I_q}\left(\bar{w}_{I_q} - \bar{w}_{qN_E}\right) + \text{Cov}[m_i, w_{E,i}]\right] \tag{4}$$

[69] This can be either from an external source or internally/endogenousely, based on the differentially weighted aggregate of all estates. Throughout the paper I use an internal wealth total (i.e. an estate-based aggregate).

where the covariance term is defined over the top I_q decedents. The formal proof of this decomposition is provided in B.2.4.

B.2.2 Interpretation and relevance

Here I discuss the interpretation of the above decompostion, drawing heavily on Alvaredo et al. (2024). I then explain the relevance of the mean mortality multiplier approach.

In order for the mean mortality multiplier approach to be valid (i.e. $Sh_q^W - Sh_{q,\text{simp}}^W = 0$), the two terms in the decomposition need to be approximately zero (**condition 1**) or offset each other (**condition 2**). One of these conditions needs to hold for validity. In addition, in case an endogenous wealth total is used, this endogeneous wealth total should be close to the true wealth total (**condition 3**).

Condition 1a. Condition 1 implies that the *average level effect* needs to be (close to) zero: $\bar{w}_{I_q} - \bar{w}_{qN_E} = 0$. In words, the average net estate value among decedents representing the top q quantile of the living population in the differential mortality multiplier approach should be close to the average net estate value among the top q quantile of decedents in the mean mortality multiplier approach. A sufficient condition for this to hold is that the average differential multiplier at the top of the estate distribution ($\bar{m}_{I_q}$) is close to the mean mortality multiplier ($\bar{m}$), since both approaches will then be based on the same group of decedents and thus the same group of net estates.

The zero average level effect condition is likely satisfied due to the occurence of two counteracting mechanisms. On the one hand, rich people tend to die later (e.g. due to living a healthier life). If rich people die later, a deceased rich person should be attributed a higher weight compared to a non-rich person (since more rich people will still be alive). On the other hand, rich people tend to be relatively old in general (e.g. Cribb 2019). If the rich are generally older, a deceased rich person should be attributed a lower weight compared to a non-rich person (since less old persons will be alive relative to young persons). As a result, the differential mortality multiplier applied to the top of the estate distribution will be close to the mean of the mortality multipliers.

Condition 1b. Condition 1 also requires that the *covariance effect* is (close to) zero: $\text{Cov}[m_i, w_{E,i}] = 0$ within the top group. In words, there is no substantial linear relationship between the differential mortality multipliers (m_i) and the estate size ($w_{E,i}$) within the top group. As discussed by Alvaredo et al. (2024), wealth accumulation tends to take place at a young age and age variability within wealth groups is large. They argue that in general the covariance of wealth and age is negative but close to zero within the top group.

Condition 2. If the average level effect and the covariance effect are not close to zero, the mean mortality multiplier approach may still be valid if the two effects offset each other.

Condition 3. In an ideal situation one would have access to a reliable estimate of private aggregate net wealth (e.g. from national accounts data). In practice, such reliable external information on aggregate wealth W is often not available. In such cases on can estimate aggregate wealth from the differentially weighted estate distribution: $W = \sum_{i=1}^{N_E} m_i\, w_{E,i}$, which is generally valid given that differential weights are appropriate across the span of the estate distribution. For the mean mortality multiplier method to be valid, it should (approximately) be the case that $W = \bar{m}\, \sum_{i=1}^{N_E} w_{E,i}$.

Relevance. Historical data on the estate distribution is often only available in tabulated form. In order to apply the differential mortality multiplier approach, these tabulations should be available by gender and age.[70] Unfortunately, such data requirements are only satisfied for a limited number of countries. However, if the mean mortality multiplier method is valid, then tabulations by estate size suffice to obtain wealth inequality estimates. Thus, as two of the authors note themselves in a previous version of their article, their findings 'may unlock a wide array of aggregate estate tabulations, previously thought to be unusable, for estimating historical trends of wealth concentration' (Berman and Morelli 2021). Their results have already been used to construct distributional estimates for Uruguay (De Rosa 2024), and in their own recent work for Belgium, Japan, and South Africa (Alvaredo et al. 2024).

As mentioned in Section 2, historical estate tax tabulations for Belgium only exist by estate size.[71] Hence, the Alvaredo et al. (2024) result is highly relevant to the Belgian context.

B.2.3 Validity of mean approach for Belgium

Here I investigate the validity of the mean mortality multiplier method for Belgium using the 2009-2022 microdata. I first impose the differential-weights based internal wealth total for both the differential and the mean multiplier approach, as the decomposition by Alvaredo et al. (2024) (explained in the previous sections) then holds exactly. There is notable year-to-year variation in the difference between the mean-based and differential-based top shares. On average, the mean method underestimates the top 1% wealth share by 2.3%-points for the gift corrected series and by 0.6%-points for the inheritance-only series. The average level effect (Figure B.2, left) and the covariance effect (Figure B.2, right) are close to zero. On average, the average level effect explains 0.9%-percentage points of the underestimation of the top 1% wealth share by the mean method for the gift corrected series (0.1%-points for the inheritance only series), whereas the covariance effect explains 1.4%-percentage points (0.5%-points for the inheritance only series).

There is no reliable wealth total for Belgium in the 20th century. Hence, the mean mortality estimates presented in this paper use an endogeneous/internal wealth total. On average the mean-based wealth total is 8.2% higher than the differential-based wealth total for the gift corrected series and 8.8% higher for the inheritance-only series (Figure B.3, left). The difference in the top 1% wealth share estimate based on the differential method relative to the mean method is 3.7%-points for the gift corrected series and 1.9%-points for the inheritance-only series (Figure B.3, right). The reason for the additional underestimation is that the subtop is structurally overweighted in the mean approach (i.e. the subtop differential weights are consistently lower than those implied by the mean approach) (Figure B.4). Since the mean approach allocates too much weight to subtop observations, aggregate net wealth will be overestimated and as a consequence top shares will be underestimated.

Overall, the mean method seems to underestimate the top 1% wealth share by between 1-6%-points for Belgium in 2009-2022. While this makes the mean approach unsuited for precise esti-

[70] Differential mortality by socioeconomic status is often related to estate size, and estate tabulations by definition include estate size.

[71] I have attempted to obtain the microdata underlying these historical tabulations or more disaggregated tabulations than those which are publicly available, but neither the microdata files nor additional disaggregations are available in the archive of Belgium's statistical agency.

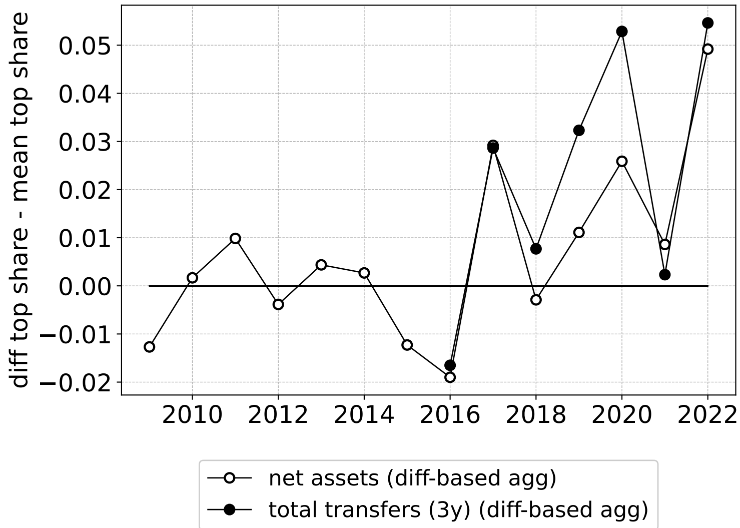

Figure B.1: Difference in top 1% wealth share estimate based on baseline differential weighting and mean weighting, with the same differential-based wealth total, inheritance only and including gifts up to 3 years before death, 2009-2022. The above series shows $Sh_q^W - Sh_{q,\text{simp}}^W$ with the same differential-based W (i.e. the mean mortality top share is also calculated based on the differential wealth total). **Source:** Own calculations based on gift and inheritance tax microdata and Statbel microdata.

mates of top wealth shares, the method seems to be sufficiently accurate for analysing long-term trends. The above results for Belgium are in line with the empirical evidence for other countries discussed in Alvaredo et al. (2024), and may thus be considered as a further validation of the mean mortality multiplier method.

In addition to examining the top 1%, I investigate the validity of the mean approach for the top 10%. The mean mortality multiplier method seems to underestimate the top 10% wealth share by around 3-8%-points (Figure B.6, right).

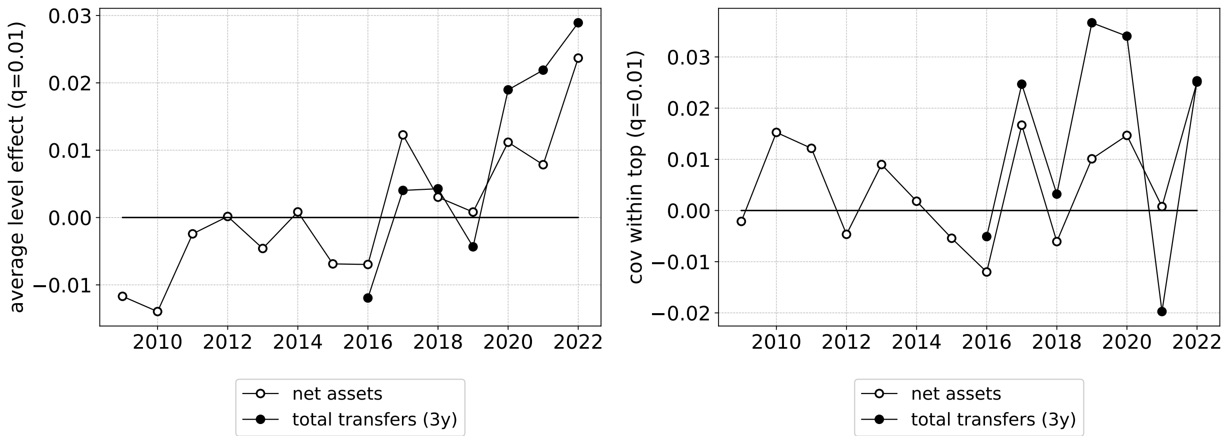

Figure B.2: Average level effect (left) and covariance within top (right) for top 1%, baseline differential weights, inheritance only and including gifts up to 3 year before death, 2009-2022. The left panel plots $\frac{I_q}{W}\bar{m}_{I_q}\left(\bar{w}_{I_q} - \bar{w}_{qN_E}\right)$, whereas the right panel plots $\frac{I_q}{W}\,\mathrm{Cov}[m_i, w_{E,i}]$. **Source:** Own calculations based on gift and inheritance tax microdata and Statbel microdata.

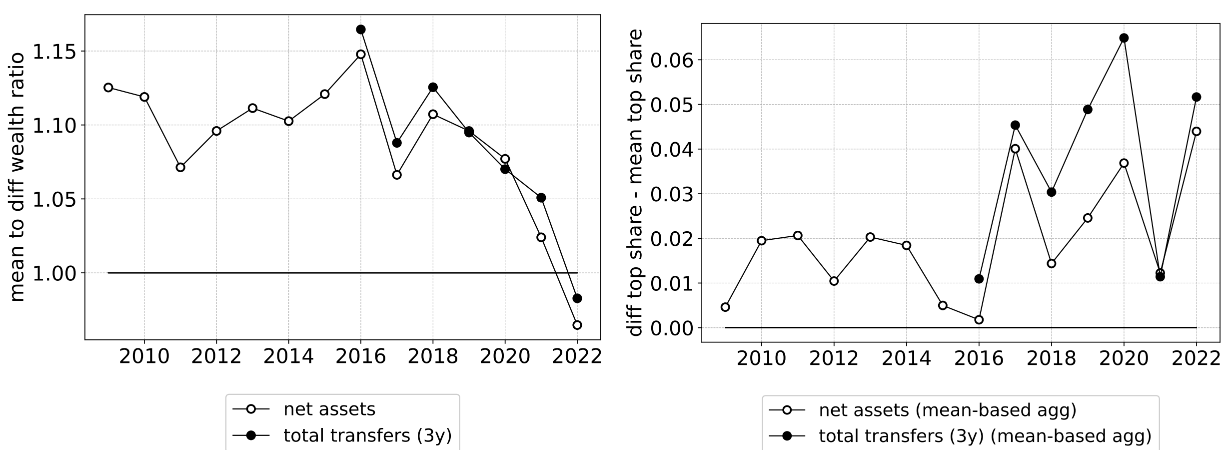

Figure B.3: Mean-based wealth total relative to baseline differential-based wealth total (left) and difference in top 1% wealth share estimate based on differential method relative to mean method, each series calculated on their own wealth total (right), inheritance only and including gifts up to 3 year before death, 2009-2022. The left panel plots the mean-based wealth total relative to the differential-based wealth total. The right panel shows the wealth share estimates using in each case for the denominator a wealth total consistent with the weighting scheme used for calculating the numerator. **Source:** Own calculations based on gift and inheritance tax microdata and Statbel microdata.

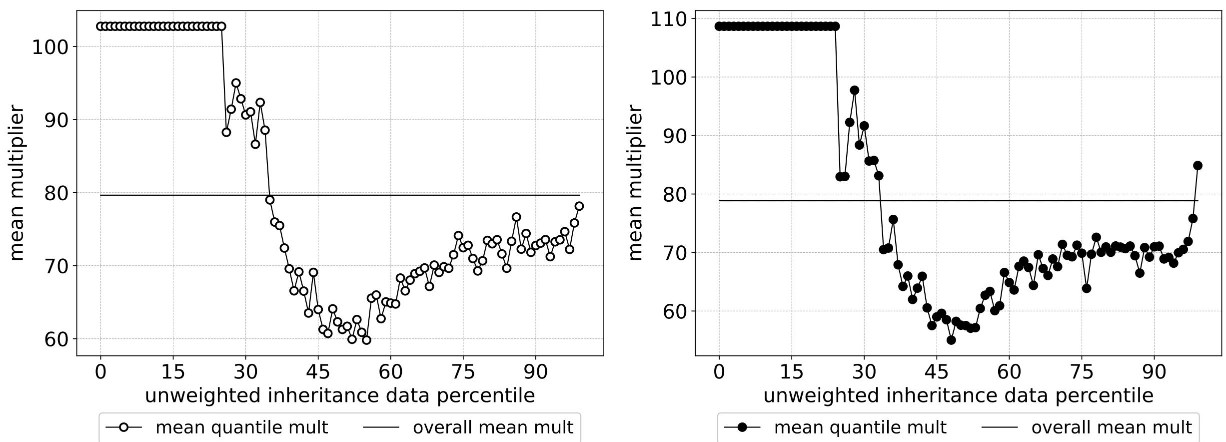

Figure B.4: Comparison of mean mortality multiplier weights and baseline differential weigths by percentile in the unweighted inheritance distribution, inheritance only (left, 2009-2022 average) and including gifts up to 3 years before death (right, 2016-2022 average). The horizontal black line indicates the weight given by the mean mortality multiplier approach, which is the same for all observations in a given year. The curve indicates the average baseline differential weights within each percentile of the inheritance distribution. Average differential weights at the bottom of the distribution are constant across percentiles, given that the average for those percentiles is calculated over all zero net wealth observations. **Source:** Own calculations based on gift and inheritance tax microdata and Statbel microdata.

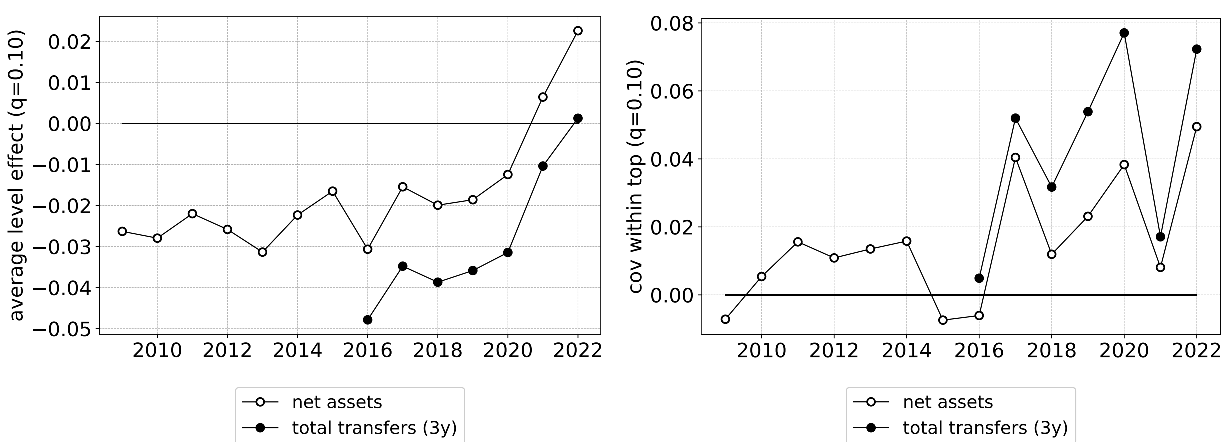

Figure B.5: Top 10% average level effect (left) and covariance within top (right), baseline differential weights, inheritance only and including gifts up to 3 year before death, 2009-2022. The left panel plots $\frac{I_q}{W}\bar{m}_{I_q}\left(\bar{w}_{I_q} - \bar{w}_{qN_E}\right)$, whereas the right panel plots $\frac{I_q}{W}\,\mathrm{Cov}[m_i, w_{E,i}]$. **Source:** Own calculations based on gift and inheritance tax microdata and Statbel microdata.

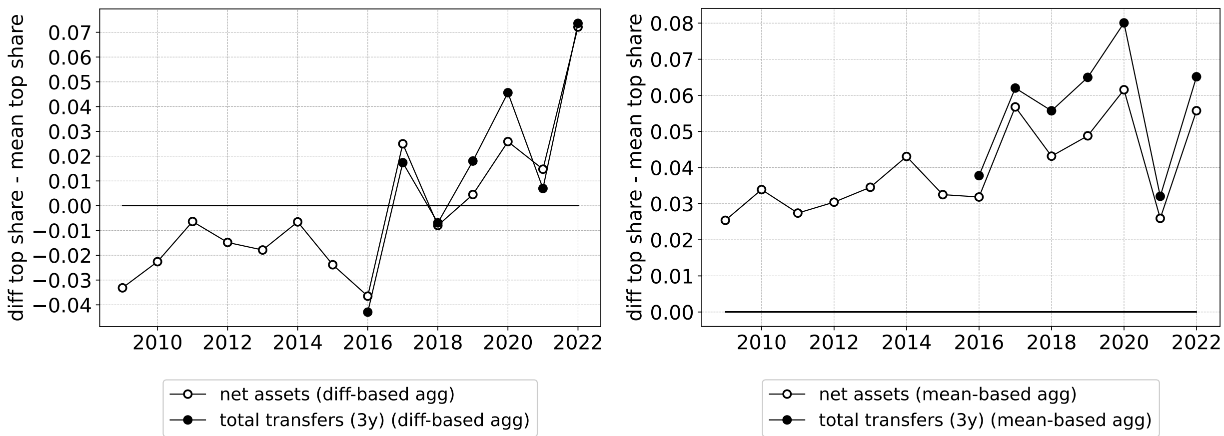

Figure B.6: Difference in top 10% wealth share estimate based on differential method relative to mean method, with a differential-based total (left) or each series calculated on their own wealth total (right), inheritance only and including gifts up to 3 year before death, 2009-2022. The left panel imposes the differentially-based wealth total as the denominator in the share calculations, whereas in the right panel the wealth total is based on the same weighting scheme as in the numerator. **Source:** Own calculations based on gift and inheritance tax microdata and Statbel microdata.

B.2.4 Derivation of decomposition

Here I derive the decomposition given in Equation 4.

Reworking the differential top share. First define the average estate among the top I_q decedents as

$$\bar{w}_{I_q} = \frac{1}{I_q} \sum_{i=1}^{I_q} w_{E,i}. \tag{5}$$

Then the numerator of Sh_q^W in Equation 2 can be rewritten as

$$\sum_{i=1}^{I_q} m_i \, w_{E,i} = I_q \, \bar{m}_{I_q} \, \bar{w}_{I_q} + I_q \; \mathrm{Cov}[m_i, w_{E,i}], \tag{6}$$

where the covariance term is defined over the top I_q decedents.

The above holds because

$$\begin{aligned} I \; \mathrm{Cov}[m_i, \, w_i] &= \sum^{I} (m_i - \bar{m})(w_i - \bar{w}) && (7) \\ &= \sum^{I} [m_i \, w_i] - \bar{m} \, \sum^{I} [w_i] - \bar{w} \, \sum^{I} [m_i] + \bar{m} \, \bar{w} \, I && (8) \\ &= \sum^{I} [m_i \, w_i] - \bar{m} \, \bar{w} \, I && (9) \end{aligned}$$

Reworking the mean top share. Denote the average multiplier among the top I_q decedents in the following way

$$\bar{m}_{I_q} = \frac{1}{I_q} \sum_{i=1}^{I_q} m_i \tag{10}$$

The following relation then holds

$$\bar{m}\, q\, N_E = q\, N = I_q\, \bar{m}_{I_q} \tag{11}$$

Define the average estate among the top $q\, N_E$ decedents as

$$\bar{w}_{qN_E} = \frac{1}{qN_E} \sum_{i=1}^{qN_E} w_{E,i} \tag{12}$$

Then note that

$$\sum_{i=1}^{qN_E} w_{E,i} = q\, N_E\, \bar{w}_{qN_E}, \tag{13}$$

Using Equation 11, the numerator of $Sh^W_{q,\text{simp}}$ in Equation 3 now becomes

$$\bar{m} \sum_{i=1}^{qN_E} w_{E,i} = I_q\, \bar{m}_{I_q}\, \bar{w}_{qN_E} \tag{14}$$

Decomposing the difference between differential and mean top shares. Subtracting the mean top share from the differential top share leads to

$$\begin{aligned} Sh^W_q - Sh^W_{q,\text{simp}} &= \frac{I_q\, \bar{m}_{I_q}\, \bar{w}_{I_q} + I_q\ \mathrm{Cov}[m_i, w_{E,i}] - I_q\, \bar{m}_{I_q}\, \bar{w}_{qN_E}}{W} \\ &= \frac{I_q}{W} \left[\bar{m}_{I_q} \left(\bar{w}_{I_q} - \bar{w}_{qN_E} \right) + \mathrm{Cov}[m_i, w_{E,i}] \right] \end{aligned} \tag{15}$$

Appendix C: A discussion of tax evasion and avoidance

Here I discuss what is known about wealth transfer tax avoidance and evasion in the 20th and 21st century. A more in depth discussion of tax avoidance via private foundations is given in Appendix D.

There is little doubt that inheritance tax evasion has been widespread throughout the 20th century (Balthazar 1971; De Reu 2009, 2011; Hardewijn 1999; Tilliet 1996; Vuchelen 1978). In his seminal work on the inheritance tax gap, Frank (1973) estimates that in 1968 around 30% of the inheritance flow went fraudulently undeclared.[72] Inheritance tax evasion was highly concentrated in movable property, as the fiscal administration had little information on movable property holdings in the 20th century (Baudhuin 1960; Delporte and Moreau 1996; Hardewyn 2005; Pacolet and Van De Putte 2000; Tilliet 1996).[73] At least partially driven by the higher share of movable property among rich individuals (e.g. Frank 1995), there seems to be little doubt among tax evasion researchers that inheritance tax evasion was mostly situated at the top of the distribution (e.g. Frank 1973; Frank and Walravens 1978; Geeroms 1986).

It is unclear how tax evasion has evolved during the 20th century. Pointing to the increasing professionalisation of the tax avoidance industry as well as the increasing documentation of economic transactions, one of Belgium's foremost 20th century fiscal experts mentions that in his experience tax evasion has declined in the course of the 20th century (Tiberghien 1990). In contrast, Frank (1988) argues that the decline in inheritance tax revenue relative to total tax revenue during 1955-1980 indicates increasing tax fraud explained by (i) an increase in the relative importance of movable property[74] and foreign-based property[75], and (ii) the ease with which inheritance taxation on movable property could be evaded.[76]

Little is known about the incidence of Belgian inheritance tax evasion in the 21st century. To the best of my knowledge, no one has attempted to estimate the inheritance tax gap (even the fiscal administrations are unable to provide an estimate). However, recent work has examined offshore tax evasion by harnessing imbalances in international financial statistics (Roine and Waldenström 2009; Zucman 2014). According to the only available estimate for Belgium, in 2007 59.8[77] billion euros of financial wealth was held offshore (Alstadsæter et al. 2018). Given the available evidence, one can reasonably assume that around 90% of offshore financial wealth is undeclared (Alstadsæter et al. 2019). Moreover, harnessing leaked property data, Alstadsæter et al. (2023) estimate that in 2020 Belgian residents held 14.1[78] billion euros of off-shore real estate. There is some ev-

[72] This estimate should not be taken at face value and has severe limitations, as Frank (1973) acknowledges.

[73] For example, Geeroms (1986) mentions (paraphrasing) the curious Belgian practice of renting empty safes. In principle, safes of death persons should only be opened with a tax official present but in practice many bank clerks allowed inheritors to open the safe in secret before the official opening. This practice was apparently so widespread that fiscal lawyer Deblauwe (1997) in an overview of inheritance tax optimisation techniques mentions the illegal technique of the 'empty coffer'. In his book on inheritance tax fraud, Delrue (2006) likewise focuses on financial movable property (thus implicitly indicating that tax fraud is concentrated in movable property).

[74] The increasing proportion of movable assets is also noted by Pacolet and Strengs (2011) and Pacolet and Van De Putte (2000).

[75] As well as the increasing facilitiation of tax haven use by Belgian financial institutions (Frank 1976).

[76] Similarly, Henrekson and Waldenström (2016) and Ohlsson et al. (2020) argue that tax avoidance and evasion has likely increased in the second half of the 20th century, especially at the top of the distribution.

[77] As per table DataF4 in their online data appendix, and using the annual dollar-to-euro exchange rate for 2007 from the National Bank of Belgium.

[78] According to table A19 in their appendix, and using the annual dollar-to-euro exchange rate for 2020 from the

idence to suggest that at least 75% of offshore real estate is undeclared (Alstadsæter et al. 2023). Lastly, by combining tax leaks with administrative data for Scandinavia, there seems to be little doubt that offshore wealth is highly concentrated at the very top of the wealth distribution (Alstadsæter et al. 2019, 2023).[79]

In recent years the opportunity for inheritance tax evasion through domesticly held movable property has declined considerably, as bearer shares[80] were abolished in 2008[81], and banks automatically block the accounts of the decedent and automatically report to the tax administration the amount held on death (Alofs et al. 2021). Moreover, there is some evidence that the automatic exchange of financial information among countries has reduced foreign-held movable property tax evasion from 2017 onwards (Boas et al. 2024).[82] Lastly, there is little doubt that inheritance tax evasion is still substantial with respect to currency, furniture, jewelry, and art objects.

In addition to tax evasion, inheritance tax avoidance is also common. An important avenue for inheritance tax avoidance is through gifts (e.g. Bourgeois and Zee 2022; Carnewal 2007; Deblauwe 1997), which are in recent years taxed at much lower rates than inheritances. Moreover, unregistered gifts of movable property have never been taxed in the Belgium, and are thus also frequently used for tax avoidance. Unregistered gifts or gifts registered outside of Belgium[83] are not included in the tax data on which this paper relies.

Until recently, rich individuals tended to gift movable property to their preferred inheritors by registering such gifts in countries where no registration tax was due. These gift registrations were considered as registered gifts for tax purposes in Belgium, and neither gift nor inheritance taxation (if the donor died within three years post-gift) were due. In 2022, only gifts of movable property registered in Belgium are considered as registered gifts for tax purposes (as mentioned in Appendix A).

In recent years, tax avoidance via partnerships ('maatschappen') has taken off. Rich individuals contribute movable property to a partnership whose shares are owned by their preferred inheritors. Such contributions are considered to be unregistered gifts, and thus not subject to taxation nor captured in the tax data underlying this paper. The rich individual can structure the partnership in such a way that she maintains control until death. There is unfortunately no data on unregistered gifts to partnerships, or wealth held in partnerships.

While there is generally no data available on unregistered gift flows, the fiscal administration does collect information on taxable wealth in private foundations. Private foundations are often mentioned as an important avenue for inheritance tax avoidance, as future inheritance taxation can be

National Bank of Belgium.

[79]The top 1% holds around 94% of all offshore financial wealth, and the top 0.01% holds around 52% of all offshore financial wealth in Scandinavia. See Alstadsæter et al. (2019). Offshore real estate is likely similarly distributed, see Alstadsæter et al. (2023) for more details.

[80]A bearer share ('effect aan toonder') is a share that is not registered in a share registry.

[81]The phase-out period ended in 2014. Belgium was one of the last countries to abolish bearer shares (Pacolet et al. 2004).

[82]Offshore financial wealth holdings may have declined by around 70% in Denmark after the automatic exchange of information (Boas et al. 2024).

[83]Gifts of movable property could be registered outside Belgium until 2021 (see Appendix A). The tax advantage is that in some countries such gifts were not subject to taxation, and the registration ensures that no inheritance tax is due if the donor dies within 3 years after death. Gifts of immovable property were always required to be registered inside Belgium (as mentioned previously).

avoided by making unregistered gifts of movable property to a private foundation controlled by oneself. Using the available administrative data, I do not find evidence that private foundations are quantitatively important (see Appendix D).

Apart from gifts, tax payers may avoid inheritance taxation by relying on the many exemptions and reductions in either the gift or the inheritance tax code (perhaps most notably those related to business wealth). As these exemptions and reductions are included in the tax data, such behaviour will not distort the resulting wealth inequality estimates.

Appendix D: Tax avoidance via private foundations

It is often argued that rich Belgian individuals make use of private foundations to avoid inheritance taxation.[84] A private foundation allows an individual to transfer ownership to a legal entity without relinquishing control. As such foundations are not considered to belong to the property of the deceased person, no inheritance taxation is due. Private foundations are not necessarily set up in Belgium (e.g. private foundations according to Dutch law are not uncommon).

Since 1921, individuals can set up a foundation for public good in Belgium. The legal requirements are quite demanding, and the Belgian finance minister needs to approve the foundation's existence. From 2002 onwards, the private foundation was introduced in the Belgian legal system (Vandenbulke 2016). It does not require the finance minister's permission and it does not need to be focused on the public good ('safeguarding the integrity of family wealth' would, for example, be an acceptable purpose).

Both private foundations and non-profit organisations are subject to a gross wealth tax levied to compensate for lost inheritance tax revenue (since foundations and non-profit organisations might have a much longer judicial life span than their benefactors). On gross wealth above 25k euros held in private foundations and non-profit organisations set-up according to Belgian law, an annual tax of 0.17%[85] was due until 2022.[86] A number of exemptions exist, most notably those on foreign real estate and 'certifications'.

Certifications were introduced in Belgium in 1998 (Jeghers 2004). They allow the owner of a company share to split (i) the right to the products or income attached to this share, and (ii) the voting rights attached to this share (Simonart 2016). In the context of private foundations, an individual would transfer the voting rights to the private foundation while distributing the right to the attached income to her chosen inheritors as a gift.[87]

Since 2005, the number of private foundations has increased substantially (see Figure D.1, left panel). The number of private foundations that are taxed, and thus have gross taxable wealth of more than 25k has increased as well but slower. While median gross taxable wealth held in private foundations remained roughly constant over time, mean gross taxable wealth increased substantially in 2006 and is continuously rising since 2015 (see Figure D.1, right panel). Hence, a small proportion of taxed private foundations holds a substantial amount of gross taxable wealth. Total gross taxable wealth held in private foundations has increased from around 5 million in 2005 to over 2.7 billion in 2022. As a caveat, one should note that not all private foundations are set up to avoid inheritance taxation, as for example some religious organisations make use of private foundations for their legal structure.[88]

[84] Among other legal structures, such as life insurance gifts (e.g. Bourgeois and Zee 2022; Carnewal 2007) or partnerships ('maatschappen'), on which no data is available.

[85] The tax rate was 0.1% between 1921 and 1939. In 1954 the gross wealth tax on non-profit organisations brought in only 28 million francs (Frank 1962). The implied gross taxable wealth (obtained through capitalisation) is around 1% of the declared inheritance flow in the same year. Hence, the relevance of non-profits is historically negligible.

[86] In 2022, the Belgian private foundation tax was made progressive with a top rate of 0.45% for gross wealth above 500k.

[87] Before the obligation to always register movable property gifts in Belgium, certificates could be gifted tax free by registering outside Belgium in a country without gift taxation on non-residents (Bogaerts 1999).

[88] Yet note that there are a number of specific tax exemptions such as those on immovable property of educational instutions. Exempted wealth does not fall under gross taxable wealth.

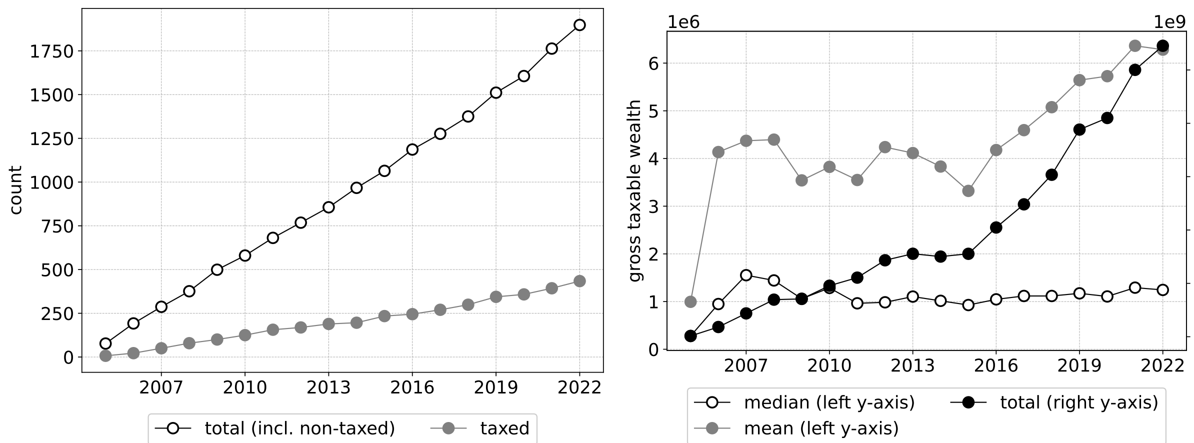

Figure D.1: Number and gross taxable wealth (constant 2022 euros) in Belgian private foundations over time, 2005-2022. The left panel shows the number of total and the number of subject-to-tax private foundations over time. The right panel shows the median, mean, and total gross taxable wealth held in private foundations. Wealth is deflated using a GDP price index. **Source:** Belgian federal tax administration. The deflator is from WID.world, accessed on 02/08/2024 (variable code: inyixx999i).

In Figure D.2, I correct for tax avoidance via private foundations by adding private foundation taxable wealth to the net wealth held by top 0.1% of the distribution. Not all private foundations are constructed for tax purposes, and some non-profits and religious organisations are legally structured as foundations. At the same time and as explained above, not all foundation wealth is taxable. Relatively speaking, little taxable wealth is held in private foundations. Hence, the impact on top 1% and top 0.1% net wealth shares is negligible.

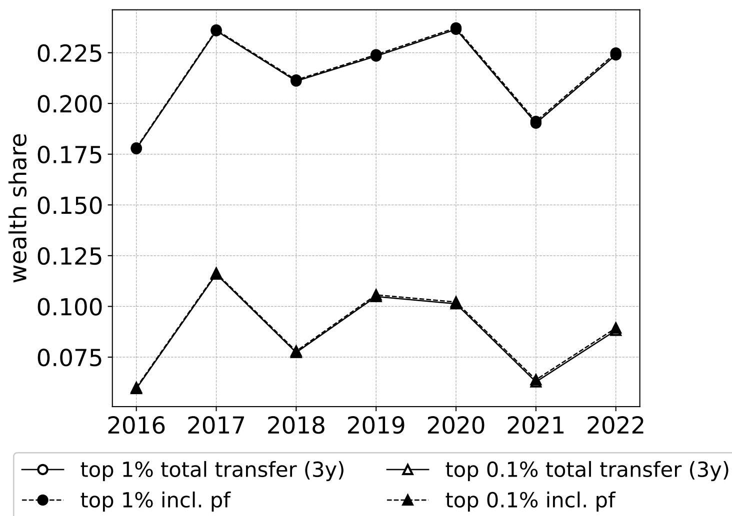

Figure D.2: Differential mortality multiplier estimates for top 1% and top 0.1% net wealth share including private foundation correction and including gifts up to 3 years pre-death, 2016-2022. This figure depicts the evolution of net wealth shares estimated using the differential mortality multiplier method and including the 3-year back gift correction. The black series additionally adds taxable wealth held in private foundations. **Source:** Own calculations based on Statbel microdata, administrative inheritance and gift microdata, and aggregated data on gross taxable wealth in private foundations from the federal fiscal administration.

Appendix E: Unreliability of registered movable gift data before 2013

In principle, digitised registered movable gift data is available since 1990 at Belgian's federal tax administration (AAPD). From 1990 up to and including 2012, the data is stored in what the AAPD calls its TP-databank. However, the tax administration itself assesses the data quality for the 1990-2012 period as poor. Some gift registrations were still done on paper and then digitised later on (which was considered as a nuisance by the concerned public servants), there was no standardised procedure for inputting the data into the system and no control on the quality of the inputted data. From 2013 onwards, the STIPAD-databank replaced the TP-databank, and all gift registrations were done digitally, leading to improved data quality.

I have tried to correct for the bad quality of the TP-data by dropping missing values (i.e. values such as '999999') and by dropping values above 1 billion euros. Even with this adjustment, the distribution of registered movable gifts of deceased persons (at different horizons, e.g. all years, 7-years before death, 3-years before death) is implausibly concentrated pre-2013.

To investigate whether the data quality improves with the use of the STIPAD-databank, the federal tax administration supplied aggregated data on all recorded registered movable gifts (i.e. including gifts from individuals that are still alive), decomposed in gifts above and below a certain threshold (5 billion, 1 billion, 750 million). For almost all years before 2013, gifts of more than 5 billion euros are present in the data. For all years after 2013, not a single gift is higher than 750 million euros. Furthermore, the distribution of registered movable gifts of deceased persons among persons with at least one registered movable gift is plausibly concentrated from 2016 (and thus with 2013 as first gift data year) onwards (see Figure E.1).

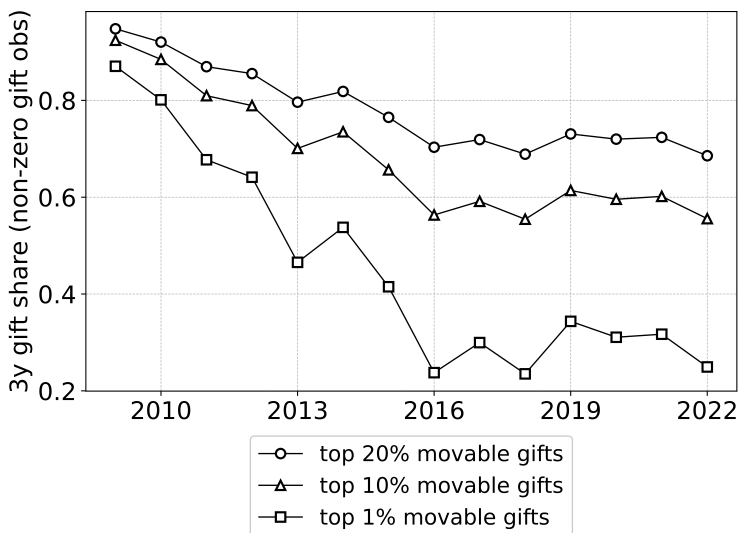

Figure E.1: Inequality of movable gifts up to 3 years before death, among decedents with movable gifts up to 3 years before death, 2009-2022. For each year and for all decedents, the recorded movable gifts up to three years before death are summed. For each of these years and for observations with at least one recorded movable gift, the inequality of this 'total gift up to 3 years before death'-amount is calculated. The figures shows that from 2016, the distribution stabilises. In combination with the absence of implausible high gift values (see text), this is an indication that from 2013 onwards the gift data quality becomes acceptable. **Source:** Own calculations based on administrative gift microdata.

Appendix F: Coverage completeness of microdata

In principle, all decedents with a net estate higher than zero are subject to inheritance taxation and their inheritors are required to declare their inheritance. In practice, the federal tax administration does not systematically impose inheritance taxation when no inheritance declaration is made. In contrast, the Flemish tax administration does systematically impose inheritance taxation on non-declared inheritances ('ambtshalve taxatie'). Moreover, it is not possible to distinguish between decedents with zero and negative net wealth as no inheritance declaration is required if a decedent has no wealth.[89]

In the dataset, all decedents without an inheritance declaration receive an imputed net inheritance of zero. As a result of the different administrative policies towards non-declared inheritances, there is a 10%-point drop in the number of zero net inheritances in Flanders in 2015 (first year of the Flemish tax data, as mentioned in Section 2) (see Figure F.1). Moreover, a density analysis reveals that the lower proportion of net zero observations in 2015 mainly leads to a higher concentration of low value net inheritances (see Figure F.2). This finding indicates that the different administrative practices might be a plausible explanation for the 10%-drop for Flanders between 2013 and 2015.

In the aggregate, there seems to be some underestimation of the inheritance share at the bottom of the distribution for Flanders pre-2015 and for Wallonia and Brussels during the entire period. However, given the small share of the bottom of the distribution in the overall inheritance flow, it does not seem necessary to apply a correction.

[89] Yet note that in the AAPD data around 7k observations do have negative net inheritances, as all correctly received declarations are digitised. In the Flemish data, the number of net negative inheritances is negligible.

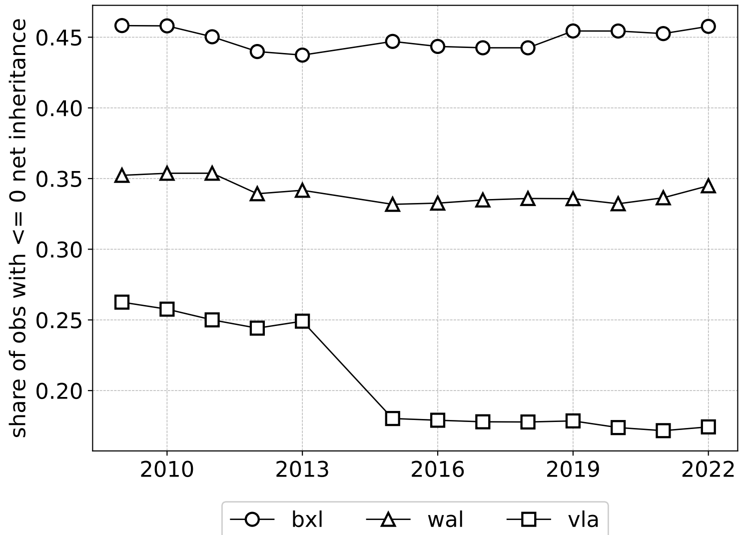

Figure F.1: Proportion of net zero inheritances by region, 2009-2022. For each year and for each region, the number of decedents with a value of zero for net inheritance are divided by the total number of decedents. Note that almost all zero values are imputed, i.e. there are very few inheritance declarations with a value of zero. **Source:** Own calculations based on administrative inheritance microdata.

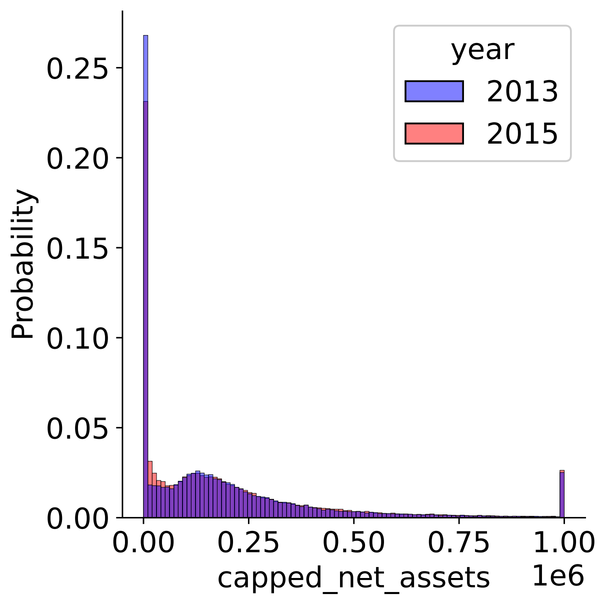

Figure F.2: Distribution of net inheritance values in Flanders, 2013 and 2015. The y-axis indicates the percentage of observations that fall within the net assets bracket (i.e. the sum of the heights of all bars is one). Net assets are capped at 0 and 1 million (i.e. extreme values are allocated to these brackets). The figure shows relative to 2015, there are more zero values in 2013. In contrast, there are more low value net inheritances in 2015 than in 2013. This indicates that in 2013 a number of low value net inheritances are uncaptured by the data. **Source:** Own calculations based on administrative inheritance microdata.

Appendix G: Correcting for net wealth of non-included decedents

As a purely administrative practice with no legal basis, for poor people (De Reu 2011; Frank 1973) with no immovable property (Lismont 1978) no inheritance declaration tended to be made. A similar issue applies to inheritance data for other countries (see e.g. Garbinti et al. 2016 for France).

In order to correctly estimate the wealth distribution, one needs to include non-included decedents and impose an assumption on their net wealth. I consider the following specifications:

- **1. Zero average net wealth.** Assume that net wealth of the non-included is equal to zero. This would overestimate wealth inequality. However, if the non-included decedents have on average very low net wealth, the overestimation may be limited.
- **2. Fixed average non-included to average included ratio.** Assume a fixed proportion of the average net wealth of the non-included relative to the average net wealth of the included. This is the approach followed by Piketty (2010) and Garbinti et al. (2016) for France. While Piketty (2010) assumes that the non-included have on average 10% of the net wealth of the average included decedent, Garbinti et al. (2016) adopt a 2% assumption. If robustness checks show that the particular value of the fixed proportion does not matter much for the resulting inequality estimates (as noted to be the case by Garbinti et al. 2016 for France), this approach may be more appropriate than assuming zero net wealth.
- **3. Variable average included to average non-included ratio, using recent microdata.** If recent data is complete or near-complete, assume that average net wealth of the non-included relative to average net wealth of the included is equal to average net wealth of the corresponding population in recent data relative to average net wealth of the remainder of the population in the recent data. To identify the corresponding population, one could approximatively assume that non-included decedents are poorer than included decedents. If so, then the corresponding population is merely the bottom of the distribution in the recent data (with the % depending on the % of the non-included). In other words, this approach then consists of assuming that (i) the non-included consist of the bottom of the distribution and (ii) the bottom-to-top ratio in recent years (for which complete data is available) is a good approximation for the bottom-to-top ratio in the past. The second assumption is likely conservative (the poorer now are less poor than in the past), while the first assumption may not be correct.
- **4. Variable average net wealth, using (historical) context information.** If (some) context-specific information is available, make an assumption of average net wealth of the non-included based on this context-specific information. This is the approach taken by Frank (1973) in the context of his project on Belgian tax evasion. Specifically, Frank (1973) assumes that the non-declared estates are uniformly distributed between 0 and the maximum exemption for 3 direct line inheritors with two children-years. The exemption thresholds vary by the number of inheritors (given that Belgium has an inheritance tax and not an estate tax) and the children-years of the inheritors (Appendix A). Note that the exemption threshold has increased 4 times over the course of the 20th century (Appendix A), so that Frank's assumption leads to 5 different nominal values for average net wealth of the non-included.

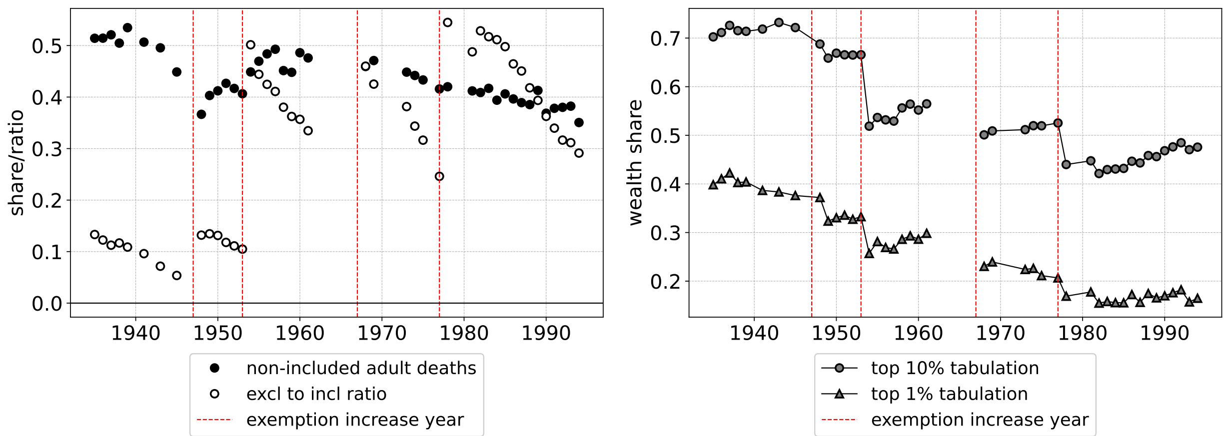

Figure G.1: Share of non-included decedents and average non-included to average included ratio implied by the Frank correction (left) and top wealth shares based on tabulations and Frank correction for the non-included (right), 1935-1994. The red dotted lines indicate years in which the inheritance tax exemption threshold increased. Non-included adult deaths are defined as the difference between the total number of adult decedents in a given year and decedent count in the inheritance tabulation of that year, divided by the total number of adult decedents. The non-included to included ratio is the average net wealth of a non-included as per Frank's specification divided by the average net wealth of included decedents. The right panel shows the top wealth shares if one applies Frank's correction for the non-included. **Source:** Own calculations based on HMD mortality statistics and inheritance tax tabulations.

The zero average net wealth assumption (specification 1) is not plausible for the Belgian context. There seems to be a consensus among (the small number of) authors who have examined the issue that non-included decedents do hold some net wealth (e.g. De Reu 2011; Frank 1973; Lismont 1978; Ministry of Finance 1973). The correction proposed by Frank (1973) indicates that net wealth of the non-included is non-neglible. Moreover, the sometimes considerable rise in the proportion of non-included decedents after tax exemption threshold increases further suggests that net wealth of the non-included may have some importance.

If one does need to correct for non-inclusion, an assumption using historical context information would seem the most accurate (specification 4). However, the Frank (1973) specification appears to be inconsistent with the evolution of non-declarations (Figure G.1, left panel). For example, the increase of the exemption threshold in 1953 leads to a small increase in the share of non-included decedents but a massive increase in the implied non-included to included ratio. As a result, the top wealth shares exhibit implausibly sharp jumps at exemption threshold increase years (Figure G.1, right panel).

As an alternative, one may draw on distributional information in the microdata for recent years to fill the gap at the bottom of the 20th century distribution (specification 3). There is not much variation in the bottom shares of recent microdata, but over the course of the 20th century there is considerable variation in the non-included to included ratio implied by this approach. One crucial assumption of this specification is that the non-included consists of the bottom of the distribution (i.e. that all non-included are poorer than included individuals), as this is how a corresponding population in the microdata can be identified. However, this does not seem to be the case. In 1975, 34% of declared inheritances were fully exempt of inheritance taxation (Lismont 1978). Hence, it seems plausible that at least some non-included decedents could have been richer than poor

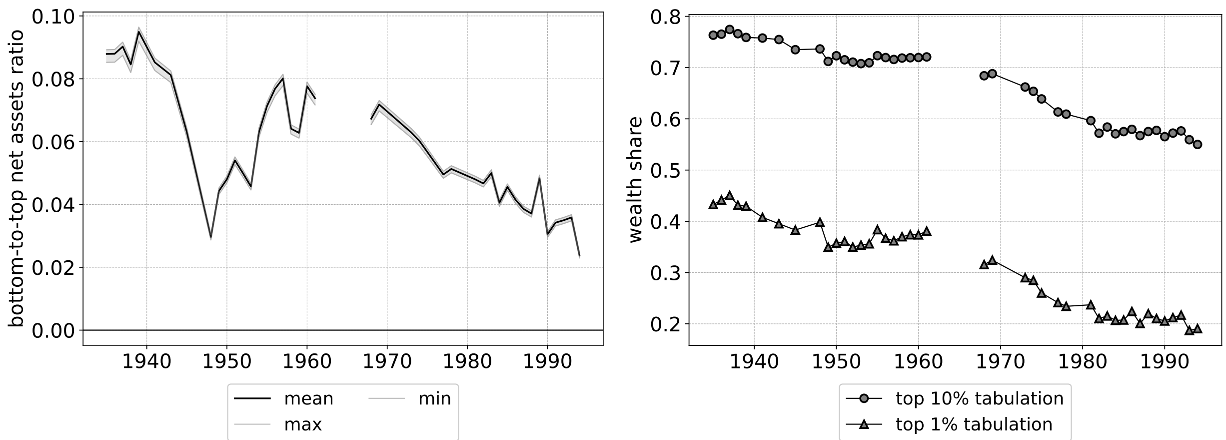

Figure G.2: Average non-included to average included ratio implied by the microdata-based approach (left) and wealth shares based on tabulations and microdata-based correction for the non included (right), 1935-1994. This left panel plots the average net wealth of the bottom x% adult decedents relative to the average net wealth of the top (1-x)% adult decedents across all microdata years (mean, maximum and minimum reported). The microdata net wealth concept is 3-year gift corrected net wealth. x refers to the non-included decedents in the tabulation year. The right panel shows the implied wealth shares if one imposes the average (across all microdata years) microdata-based non-included to included ratio. **Source:** Own calculations based on HMD mortality statistics, inheritance tax tabulations, and gift and inheritance tax microdata.

included decedents.

In light of the above considerations, I adopt a fixed average non-included to average included ratio (specification 2) for the baseline series. This specification does correct implicitly for exemption threshold increases, as any rise in the average net wealth of the included (due to an increase in non-inclusion at the bottom) leads to a proportional increase in the average net wealth of the non-included. In light of the high non-included to included ratio implied by the Frank correction, I adopt a 10% fixed ratio assumption. This assumption is conservative with respect to specification 3, as the highest variable ratio is slightly over 8% (see Figure G.2). As shown below, even much higher ratios do not lead to qualitatively different results (Figure G.3).

The correction for average net wealth of the non-included is unfortunately somewhat arbitrary, due to the lack of reliable information on the net wealth of this group. However, all four specifications lead to broadly similar results: wealth inequality has decreased considerably over the course of the 20th century. Hence, it seems as if the results are rather robust to correcting for the non-included.

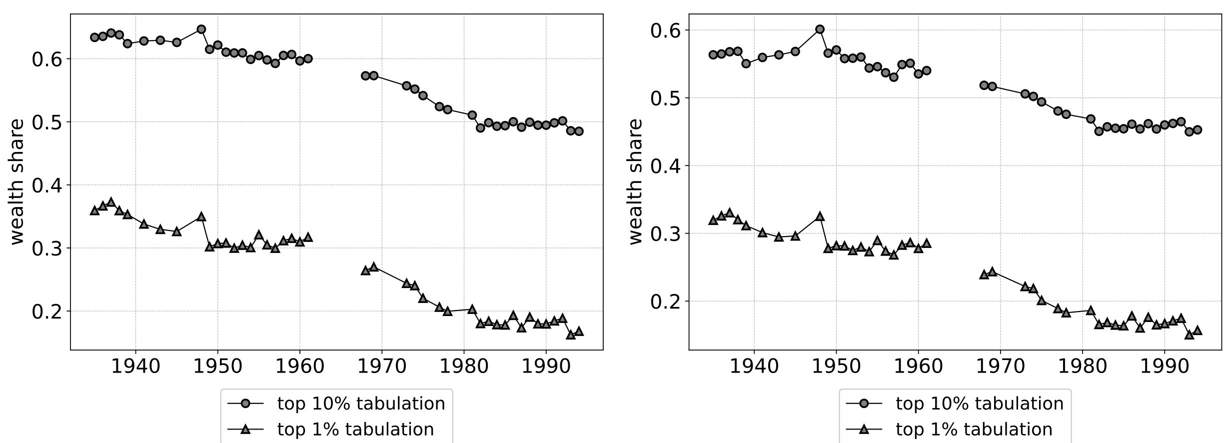

Figure G.3: Top 1% and top 10% wealth share estimates based on 25% (left panel) and 40% (right panel) fixed non-included to included ratio. The left panel plots the implied wealth shares if the non-included hold on average 25% of the net wealth of the included. The right panel shows the implied wealth shares if the non-included hold on average 40% of the net wealth of the included. **Source:** Own calculations based on HMD mortality statistics and inheritance tax tabulations.

Appendix H: Gross-to-net correction of raw inheritance tax tabulations

For data starting in 1968, the tabulated data are categorised according to total inheritance value, while net inheritance value is of interest (i.e. assets minus liabilities). I have applied two correction methods. Before explaining these methods, one should note that it is possible to calculate a total-to-net-inheritance ratio for each inheritance bracket (since total and net inheritance totals are reported for each bracket).

The first correction method (pre-GPI correction) consists of rescaling the thresholds (e.g. if the total-to-net-inheritance ratio of a particular bracket is 1.05, then the corrected threshold is 1/1.05) as well as the bracket averages. From this point onwards, the standard procedure as explained above is followed.

For some brackets near the end of the distribution and for some years, the corrected threshold is below average net wealth. The explanation for this phenomenon is that the higher bracketed inheritances include relatively more liabilities, so that on average the net inheritance is lower than the net inheritance in the lower bracket.

An example may clarify: assume that in the 0-50 bracket total assets equal net assets (i.e. there are no liabilities) and that average total/net assets amount to 49. Further assume that in the next 50-100 brackets total assets are 100% larger than net assets. In the case that total assets are equal to 80, net assets would be equal to 40. The adjusted net wealth bracket is now 25 (as the thresholds are rescaled with the total-to-net ratio). As the net asset average of the lower bracket exceeds the adjusted threshold, the GPI method cannot be applied.

The issue can be tackled in two ways: (1) years where this phenomenon applies can be discarded, or (2) brackets can be aggregated. Option (2) seems most sensible, and has been implemented.

The second correction method (post-GPI correction) involves estimating the total (rather than net) inheritance distribution (i.e. correcting for the non-included population and applying GP-interpolation), and then correcting this distribution with the total-to-net-inheritance ratio of the corresponding inheritance bracket (e.g. if total-to-net-inheritance ratio of the top 1% inheritance bracket amounts to 1.05, then estimated total assets held by the top 1% will be corrected by a 1/1.05 factor).[90]

As shown in Appendix J using the microdata sample, both correction methods are likely very accurate. For the estimates presented in the main part of the paper, the second correction method was followed.

[90] I also take into account that there might be some reshuffling at the edges of inheritance brackets (since I discretise the distribution and then rerank the discretised parts), e.g. that some individuals previously belonging to the top 1% of the total asset distribution become part of the 1-2% of the net inheritance/wealth distribution once total-to-net ratios are applied.

Appendix I: GPI estimation of tabulated microdata

As explained in Section 3.1, the inheritance/wealth distribution is estimated from inheritance tax tabulations based on the Generalized Pareto Interpolation (GPI) approach. A concern might be that the GPI approach does not lead to a good approximation of the underlying distribution, either due to (1) the assumed functional form/estimation procedure; or (2) the small number of tabulation data points (i.e., the small number of inheritance size categories used for the tabulations).

One should note that the GPI approach has been validated empirically by Blanchet et al. (2022). Moreover, the inheritance tax tabulations for Belgium are characterized by quite granular inheritance size categories at the top of the distribution. Given the large concentration of inheritance flows at the top, such a granular representation of top inheritance flows could imply high precision of the distributional estimate.

Here the appropriateness of the GPI assumption for Belgium is checked using the available administrative microdata. First, for each year for which tabulated data is available the population shares corresponding to the inheritance size categories were obtained. Secondly, the population shares for each tabulation were then applied to each year for which the microdataset is complete. 'Completeness' implies that that the microdataset (i) has approximately 100% coverage, and thus captures the distribution completely (2009–2022), and (ii) that a 3-year gift correction is possible (2016-2022).[91] In other words, a tabulation was constructed for each 'complete' microdata year (2016–2022) and for each available tabulation year such that the constructed tabulation divides the population exactly the same as the corresponding tabulation.[92] In a next step, the tabulated microdata served as input for the GPI approach. Lastly, GPI-based estimates of the distribution based on tabulated microdata were compared with the actual distribution (i.e. the complete microdataset) for each percentile.

The GPI approach and the structure of the Belgian tabulations (concentration of tabulation points at the top) leads to a remarkably good fit with the actual microdata (Figure I.1). The maximum difference between the GPI-estimate and the actual distribution is 0.02%-points for the top 1%, and 0.01%-points for the top 10%. The maximum deviation across all percentile bracket shares is 0.07%-points, with a 0.02%-points standard deviation.

Since data points from the inheritance tabulations are concentrated at the top and given that the inheritance distribution used to be more unequal in the past (and thus inheritances more concentrated at the top), the actual fit of the GPI-derived estimate and the historical inheritance distribution might be even more satisfactory than indicated here.

[91] Actually, running the robustness check described here just on the inheritance data (which then includes 2009–2015) leads to very similar conclusions on the performance of the GPI approach.

[92] An example may clarify. Assume that in a certain tabulation year, say yyyy, the highest bracket represents 0.04% of the population. I then construct for each microdata year a tabulation that aggregates the top 0.04% observations in one bracket. And I do this for all brackets in the original tabulation from yyyy.

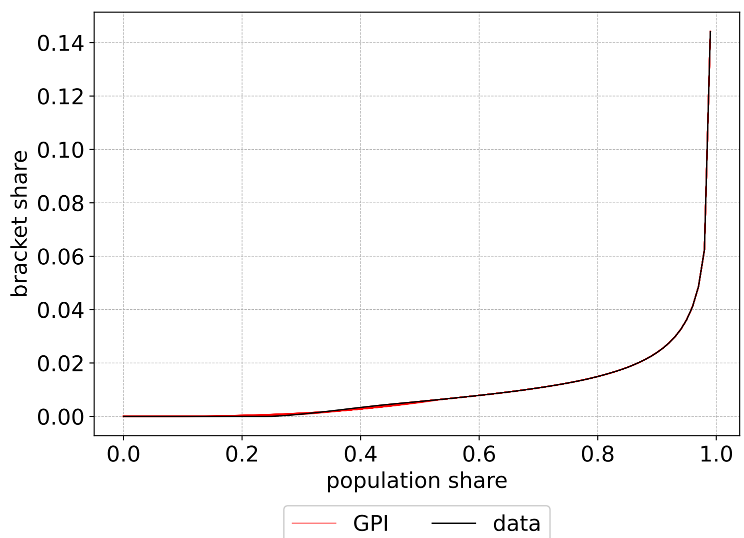

Figure I.1: GPI-based estimates and actual distribution, 2016. The red lines indicate the GPI-based estimates, while the black line shows the exact distribution. The bracket shares are plotted for each percentile. The closeness of the red lines with the black line is graphical evidence of the appropriateness of the GPI approach. Only 2016 microdata and GPI-estimates based on tabulated 2016 microdata are included here (since the maximum percentile deviation across all complete microdata years is situated in 2016), but for other years the deviations from the actual distribution are comparable in magnitude. Tabulated 2016 microdata is based on net inheritance categories from 1935-62 tabulations, since 1968-94 tabulations consists of gross inheritance categories. See Appendix J for a similar robustness check on 1968-94-like tabulated microdata. **Source:** Own calculations based on inheritance tabulations, and administrative inheritance and gift microdata.

Appendix J: Comparison of pre-GPI and post-GPI rescaling of gross inheritance categories

As mentioned in Section 3.1, historical inheritance tabulations from 1968 onwards consist of gross inheritance size categories. In the context of a distributional analysis, the net inheritance distribution is of interest. Hence gross inheritance categories need to be transformed into net distributional estimates.

As explained in Appendix H, two approaches are possible to arrive from gross inheritance tabulations at net inheritance distributional estimates. The pre-GPI approach consists of rescaling gross inheritance categories to net inheritance categories using information on liabilities available for each gross category, and then inferring the distribution by applying GPI to the rescaled categories. In the post-GPI approach, the gross inheritance distribution is inferred using GPI, and a densely discretised gross inheritance distribution is then rescaled using category-specific gross-to-net correction factors.

Here the precision of both gross-to-net approaches, and thus their overall robustness, is explored using the available microdata. Similarly to the analysis reported in Appendix I, the population shares for each (gross) inheritance category and each historical tabulation year were retrieved. In a second step, a tabulation was created for each complete microdata year (i.e. a year for which the microdataset has near-100% coverage) and for each historical tabulation year (by imposing the historical bracket population shares on the microdataset). For each of these tabulations, both the pre-GPI and the post-GPI approaches were applied, and compared with the actual net inheritance/wealth distribution.

The pre-GPI approach closely resembles the actual distribution (Figure J.1). The maximum difference (across all historical tabulation years and all complete microdata years) for the top 1% is 0.2%-points, while the maximum difference for the top 10% amounts to 0.3%-points. The maximum deviation across all percentile bracket shares is 0.2%-points, with a standard deviation of 0.02%-points.

Similarly to the pre-GPI approach, the post-GPI approach leads to precise results (Figure J.2). The maximum difference between the post-GPI estimate for the top 1% and the actual top 1% share is 0.2%-points, with a maximum difference of 0.5%-points for the top 10%. Across all bracket shares, the maximum deviation amounts to 0.2%-points, while the standard deviation for percentile bracket share differences equals 0.03%-points.

Overall, both the pre-GPI and the post-GPI rescaling approaches lead to satisfactory estimates of the distribution.

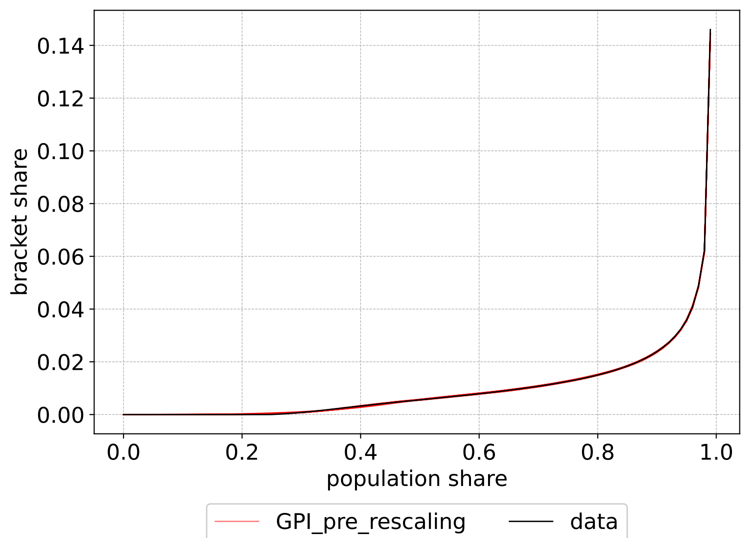

Figure J.1: Pre-GPI rescaling estimates and actual distribution, 2020. The red lines indicate the pre-GPI-based estimates, while the black line shows the exact distribution. The bracket shares are plotted for each percentile. The closeness of the red lines with the black line is graphical evidence of the appropriateness of the pre-GPI approach. Only 2020 microdata and GPI-estimates based on tabulated 2020 microdata are included here (since the maximum percentile deviation across all complete microdata years is situated in 2020), but for other years the deviations from the actual distribution are comparable in magnitude. Tabulated 2020 microdata is based on net inheritance categories from 1968-94 tabulations, since for earlier tabulations net inheritance categories are available. **Source:** Own calculations based on inheritance tabulations, and administrative inheritance and gift microdata.

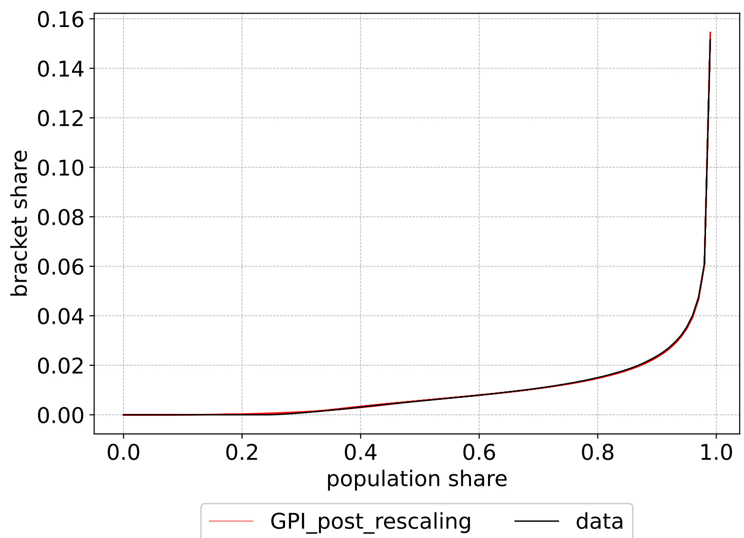

Figure J.2: Post-GPI rescaling estimates and actual distribution, 2022. The red lines indicate the post-GPI-based estimates, while the black line shows the exact distribution. The bracket shares are plotted for each percentile. The closeness of the red lines with the black line is graphical evidence of the appropriateness of the post-GPI approach. Only 2022 microdata and GPI-estimates based on tabulated 2022 microdata are included here (since the maximum percentile deviation across all complete microdata years is situated in 2022), but for other years the deviations from the actual distribution are comparable in magnitude. Tabulated 2022 microdata is based on net inheritance categories from 1968-94 tabulations, since for earlier tabulations net inheritance categories are available. **Source:** Own calculations based on inheritance tabulations, and administrative inheritance and gift microdata.

Appendix K: Robustness check for gift-inclusion period

In the baseline gift-corrected series, I add deflated gifts up to 3 years before death to a decedent's net inheritance. Here I investigate whether different gift inclusion time horizons impact the results. The distributional estimates seem very robust to the chosen time horizon (Figure K.1).

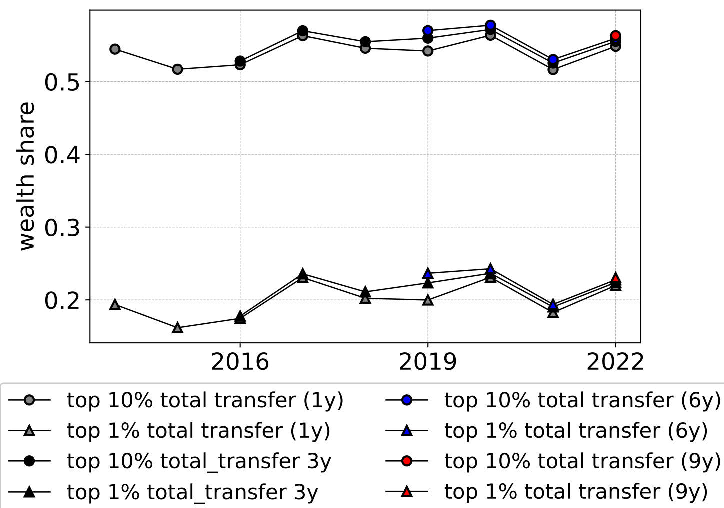

Figure K.1: Baseline differential mortality multiplier top 1% and top 10% wealth share estimates for Belgium, different gift correction time horizons, 2014-2022. This figure depicts the evolution of net wealth shares estimates using the baseline differential mortality multiplier method. The series differ in the time horizon of gift-inclusion (1 year before death, 3 year before death, 6 year before death, 9 year before death). As reliable movable gift data is only available from 2013 onwards, longer gift correction time horizon series start in later years. **Source:** Own calculations based on Statbel microdata and administrative inheritance and gift tax data.

Appendix L: Small mismatch in death count microdata and official death count

In the administrative inheritance tax data, there are slightly more decedents in any given year compared to the official Statbel death count (Figure L.1, left panel). However, as some observations cannot be linked to Statbel sociodemographic microdata, the linked sample has somewhat less decedents in each year than the official death count (Figure L.1, right panel). There seem to be two reasons for this mismatch: (i) in some cases tax officials seem to have made mistakes in the input of the population registry number, and (ii) Statbel's inclusion criteria for official deaths[93].

Due to the way in which the microdata are supplied by the tax administration, decedents whose official population registry number is wrongly recorded by tax administration officials will appear twice in the microdata (once with zero net wealth). After matching, only the zero net wealth observations remain in the sample. Hence, one approach would be to appropriately replace zero wealth linked decedents with their unlinked doubles, identified based on the similarity of their covariates. However, these unmatched doubles (for whom net wealth is accurately reported) are heavily dominated by zero net wealth individuals (Figure L.2). Given the small scale of the mismatch and the observation that the involved decedents are likely correctly included with zero net wealth, I do not apply a further correction.

[93]For example, infant deaths are only recorded in the national registry if the infant lives until January 1st (Otavova et al. 2024).

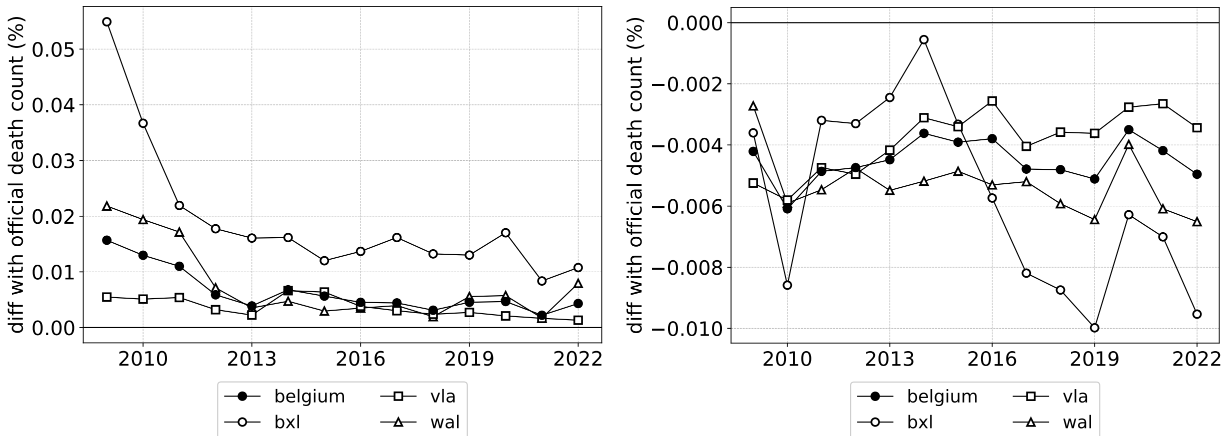

Figure L.1: Difference between the official death count as published by Statbel and the deaths registered in the microdata pre-matching (left) and post-matching (right), 2009-2022. A positive difference indicates that the number of deaths in the microdata is higher than the official death count. Region in the microdata is based on last recorded residence, and only individuals with fiscal residence in Belgium are included. 'bxl' refers to Brussels, 'vla' refers to Flanders, and 'wal' refers to Wallonia. **Source:** Own calculations based on Statbel microdata, and administrative inheritance and gift microdata.

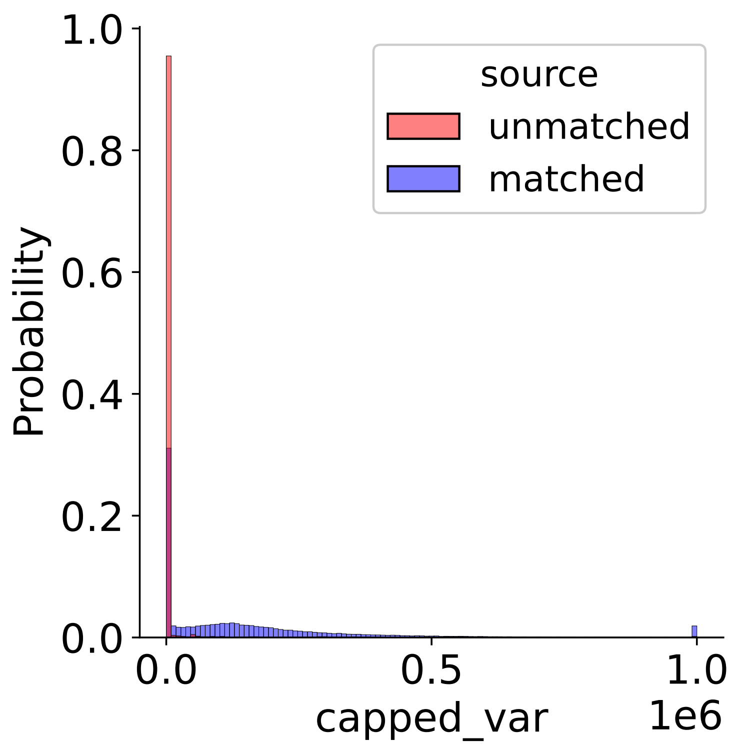

Figure L.2: Density plot of net assets of matched and unmatched decedents, 2009. Here I plot the density of observations that can be matched to Statbel microdata and observations that are unmatched. Results are shown for 2009 as the mismatch is highest in that year, but results for other years and for gift-corrected series are very similar. The y-axis indicates the percentage of observations that fall within the net assets bracket (i.e. the sum of the heights of all bars is one). Net assets are capped at 0 and 1 million (i.e. extreme values are allocated to these brackets). **Source:** Own calculations based on Statbel microdata, and administrative inheritance and gift microdata.

Appendix M: Donor-recipient assumptions for movable gifts in the federal data

To a large extent, the administrative movable gift data of the federal administration does not distinguish between donors and recipients (only the aggregated sum of 'titularissen' is recorded).[94] This issue affects around 30% of all gifts used for the baseline gift correction, corresponding to around 20% of the aggregate gift value used for the baseline correction. Hence, I need to impose an assumption to (i) identify donors, and (ii) divide the gift among donors. Once such an assumption is made, I can add the gift to the inheritance data of the donor-decedent(s).

The administration has supplied me with (i) the number of individuals associated with a gift (i.e., the sum of donors and recipients), (ii) the number of decedents among those individuals, and (iii) the order in which those individuals died. These variables allowed me to implement two opposing assumptions:

- **Single donor.** I assume that there is only one donor for each gift. If only one of the individuals is deceased, I assign the gift to the deceased individual.[95] If multiple of the associated individuals are deceased, I assign the gift to the individual that died first. This assumption maximalist, as it maximizes the concentration of gifts and thus will maximize estimated wealth inequality.
- **Single recipient.** I assume that there is only one recipient for each gift. If all associated individuals are deceased, I assume that the person who died last is the recipient and assign the gift to all other associated individuals on an equal split basis. If at least one associated individual is still alive, I assume that the recipient is still alive and allocate the gift to all other individual (living or death) on an equal split basis. This assumption is conservative, as it spreads out the gift over as many individuals as possible and assumes an equal split among those individuals. As a result, this assumption will minimize the estimated wealth concentration.

As a baseline assumption, I rely on the 'single recipient'-split as it is somewhat more conservative. However, the 'single donor'-split leads to extremely similar results (Figure M.1). The reason for this similarity seems to be that the donor-recipient assumption is only imposed on a small fraction of the gift data, and does not lead to substantial changes within its target observations.[96]

In a relatively small number of cases, the gift is associated with only 1 individual. In reality, there will always have been both a receiver and a donor. In such cases, I assume that the individual is the donor. This assumption seems plausible given the small pre-death time horizon of the gift correction. In fact, dropping gifts associated with only 1 individual has an extremely limited impact on the results (Figure M.2).

[94] From 2015 onwards and for notarially registered gifts, donors and recipients are distinguishable.

[95] As the gift can plausibly be considered pre-death tax avoidance, especially given the small pre-death time horizon considered for the baseline gift correction.

[96] One reason for this is that almost half of these observations have exactly two associated individuals and in that case the gift is in both correction approaches associated with the (first) deceased individual.

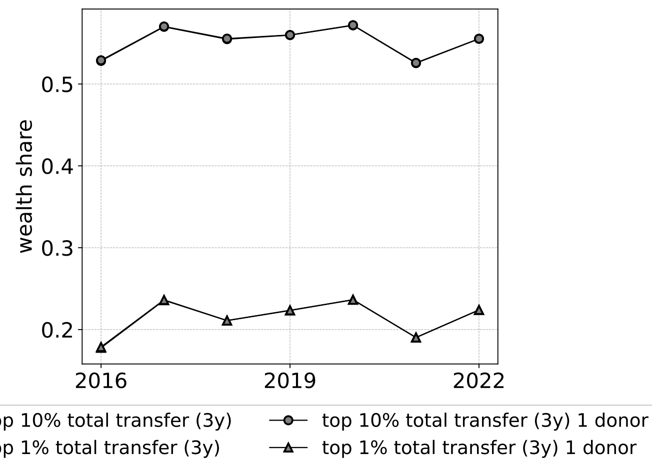

Figure M.1: Baseline differential mortality multiplier top 1% and top 10% wealth share estimates for Belgium, different assumptions on distributing gifts among associated individuals, 2016-2022. This figure depicts the evolution of net wealth shares estimates using the baseline differential mortality multiplier method. The baseline series assumes that there is only one receiver, whereas the '1 donor' series assumes that there is only one donor. **Source:** Own calculations based on Statbel microdata and administrative inheritance and gift tax data.

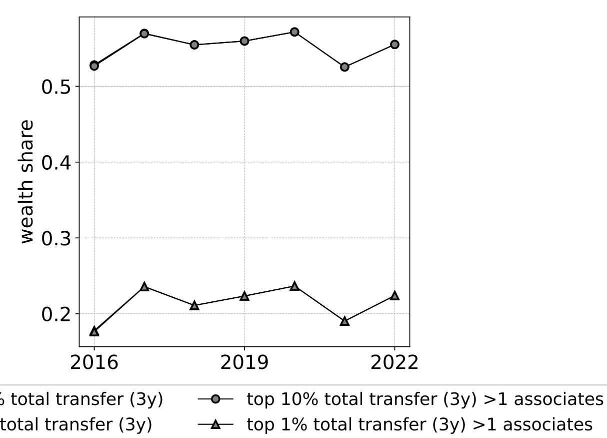

Figure M.2: Baseline differential mortality multiplier top 1% and top 10% wealth share estimates for Belgium, including and excluding gifts with which only one individual is associated, 2016-2022. This figure depicts the evolution of net wealth shares estimates using the baseline differential mortality multiplier method. For gifts with only one associated individual, the baseline series assumes that this individual is the donor. In contrast, the other series assumes that this indiivdual is receiver (and thus those gifts are not included in the gift correction). **Source:** Own calculations based on Statbel microdata and administrative inheritance and gift tax data.

Appendix N: Definition of differential mortality multipliers

Here I provide more details on the definition of the differential mortality multipliers. I do not discuss the 'naive' weights, as they are simply defined by 10-year age group, gender, and region.

N.1 'Theory-driven' weights

The theory-driven weights are defined by 10-year age group, gender, region, and socio-economic status groups.

Socio-economic status scores are calculated in line with previous demographic work for Belgium by Eggerickx et al. (2018a). Unfortunately, the information provided in Eggerickx et al. (2018a) does not allow a perfect replication and the authors did not reply to multiple clarification requests. Hence, the sociodemographic weights used here might differ slightly from those in Eggerickx et al. (2018a). The socio-economic status score is calculated as follows for each available census year:

- **Education** (40% weight)
  - 0: no education, 1: primary, 2: lower secondary, 3: higher secondary, 4: tertiary
- **Employment** (20% weight)
  - 0: unemployed, 1: inactive, 1.5: retired/employed/studying
  - if employed then additionally, 0: blue collar/non-standard, 0.5: public sector/white collar, 1: self-employed, 1.5: management
- **Housing** (40% weight)
  - 0: tenant, 5: owner
  - additively, 1: bathroom, 1: central heating, 1: single-home building, 0-2: number of rooms/inhabitant

For individuals aged less than 25 years age old in the census year, I set the socio-economic status score to missing given the unreliability of the employment, education, and (to a lesser extent) housing variabes as an indicator of socio-economic status at that age. In a next step and following Eggerickx et al. (2018a), non-missing socio-economic status scores are divided into four quartiles. I then allocate the socio-economic status group in the closest previous census year to each living and death individual (i.e. individuals in 2015 get a socio-economic status score based on the 2011 census), and consider missings as a seperate category.[97]

Overall, the socioeconomic status scores are highly correlated with inheritance ranks (Figure N.1, left panel). There is some intragroup variation (Figure N.1, right panel), as can be expected given that socio-economic status is not solely related to net wealth. At the same time, this intragroup variation should not be considered problematic to the extent that the social gradient is well-captured by the socio-economic status scores (given that deaths do then remain approximately

[97] Disregarding missings would exclude observations non-randomly, and would thus bias the results.

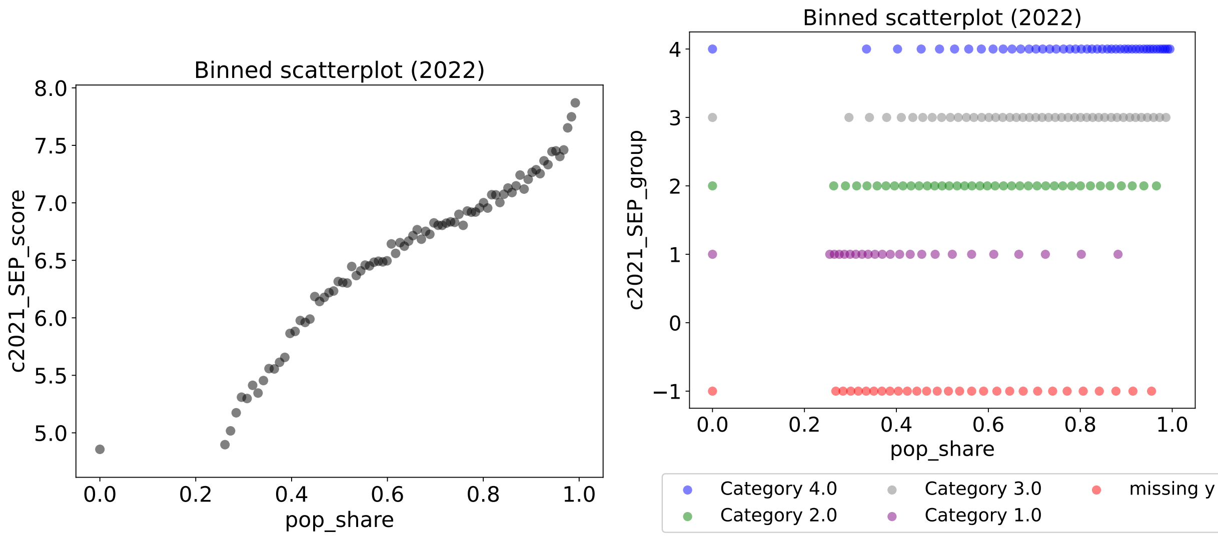

Figure N.1: Binned scatterplot of relation between 'theory-derived' socioeconomic status and inheritance ranks, overall (left) and within socioeconomic status groups (right), 2022. The left panel shows the relationship between inheritance ranks (x-axis) and socio-economic status scores (y-axis) for 2022. There is a large gap at the bottom percentiles given that the average is taken across all net zero inheritance observations (this average is then plotted at 0). The right panel plots the distribution of inheritance ranks (x-axis) for each of the socio-economic status groups used for weighting (y-axis). Results are consistent for other sample years. Overall, this figure shows that higher economic status scores tend to imply higher inheritance ranks, although with some intra socioeconomic status group variation. **Source:** Own calculations based on gift and inheritance tax microdata and Statbel microdata.

random within the defined sociodemographic groups, and the weighted sample then stays representative for the population).

N.2 'Data-driven' weights

The data-driven weights are defined by 10-year age group, gender, region, and predicted inheritance rank group.

I predict inheritance ranks by training a gradient booster model on the inheritance microdata in the following way:

- The outcome variable is the rank of an observation for the relevant net wealth concept (i.e. with or without gifts)
- The features consist of census variables related to housing, education, employment, the calculated socio-economic status scores, and annual sociodemographic variables. These annual variables are age, gender, region, fiscal income, number of children, nationality, civil status, and household type.
- The sample is split in 80-20% train-test samples stratified on age (above/below 60) and the bottom 50%, the 50-70% quantile, the 90-99% quantile, the 99-99.9% quantile, and the top 0.1%.

- The algorithm is HistGradientBoostingRegressor from scikit-learn, with mean-squared error as the loss function.
- Hyperparameter tuning consists of a 1000-draw random grid search with 5-fold cross-validation. The hyperparamter grid is defined as follows:
  - `learning_rate = [0.00001, 0.0001, 0.01, 0.1, 0.2, 0.5]`
  - `max_iter = [100, 200, 300, 400, 500, 600, 700, 800, 900, 1000]`
  - `max_leaf_nodes = [10, 31, 50, 100, 150]`
  - `max_depth = [2, 4, 6, 8, 10]`
  - `min_samples_leaf = [1, 2, 4, 7, 10, 30]`
  - `l2_regularization = [0.0001, 0.001, 0.01, 0.1, 1]`
  - `max_features = [0.1, 0.2, 0.3, 0.5, 0.7, 0.9]`
- The final model is then used to predict inheritance ranks for all observations in the microdata (living and death).
- The predicted inheritance ranks are divided into quartiles. These quartiles are defined based on the distribution of predicted inheritance ranks in the inheritance microdata.

The above procedure is repeated for two-years samples of inheritance microdata (2009-2010, ..., 2021-2022) for the without-gift net wealth concept, and for one three-year sample (2016-2018) and two two-years samples (2019-2020, 2021-2022) for the with-gift net wealth concept. Grouping years in this way heightens the number of training observations and allows for full use of the additional data available in later years.

Appendix O: Results of non-baseline differential weights

Here I present the main plots of the paper based on non-baseline weighting schemes. As these plots are quite close to those using baseline weights, the main results appear robust to the differential weighting procedure.

O.1 'Naive' weights

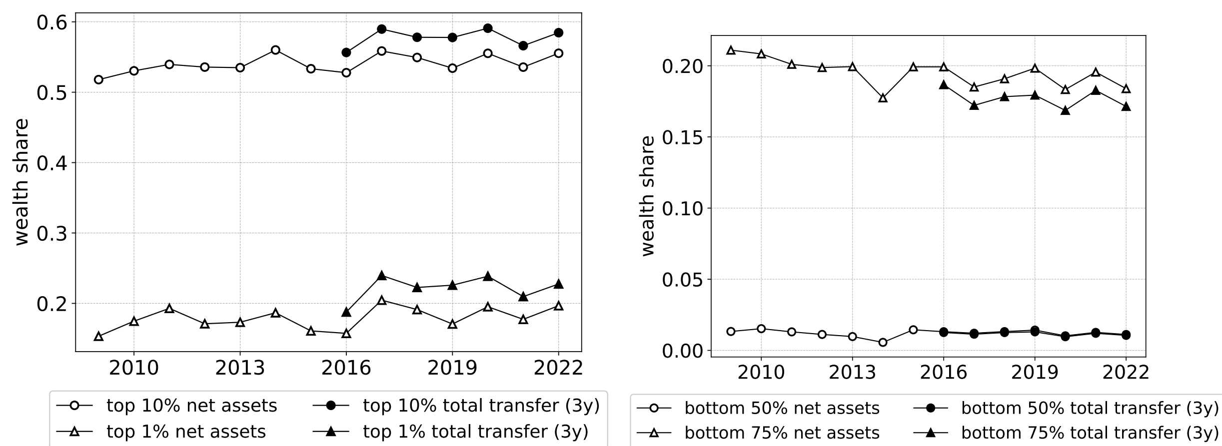

Figure O.1: Naive differential mortality multiplier top 1% and top 10% wealth share (left), and bottom 50% and 75% wealth share (right) estimates for Belgium, inheritance only and including gifts up to 3 years before death, 2009-2022. This figure depicts the evolution of net wealth shares estimated using the naive differential mortality multiplier method. The 2009-2022 series are exclusively based on inheritance declarations ('net assets'), while the 2016-2022 series take into account 3-year pre-death gift history ('total transfer (3y)'). **Source:** Own calculations based on Statbel microdata and administrative inheritance and gift microdata.

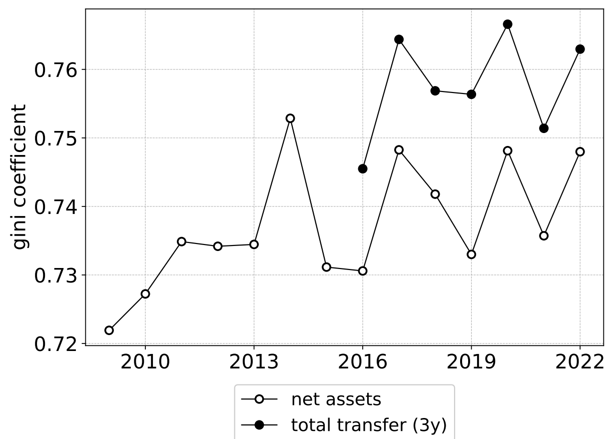

Figure O.2: Naive differential mortality multiplier gini coefficient estimates for Belgium, inheritance only and including gifts up to 3 years before death, 2009-2022. This figure depicts the evolution of gini coefficients estimated using the naive differential mortality multiplier method. The 2009-2022 series is exclusively based on inheritance declarations ('net assets'), while the 2016-2022 series takes into account 3-year pre-death gift history ('total transfer (3y)'). **Source:** Own calculations based on Statbel microdata and administrative inheritance and gift microdata.

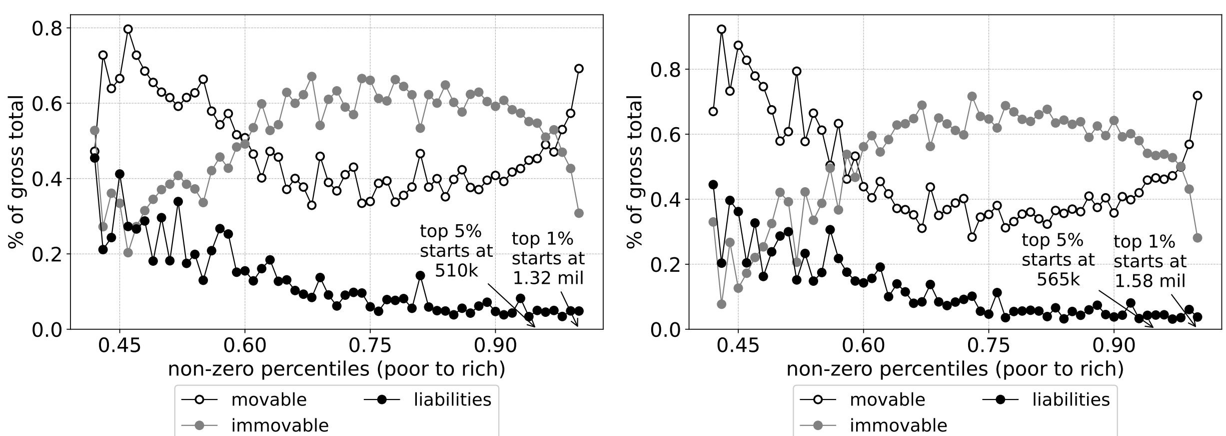

Figure O.3: Asset decomposition for 2022 living adult population by percentile of net assets in movable and immovable assets and liabilities as a share of gross assets, only inheritance data (left) and including gifts up to 3 years before death (right), naive differential weights. This figure depicts the asset composition by percentile for individuals with non-zero net wealth. The denominator consists of gross (i.e. without taking debt into account) assets (including gifts up to 3 years before death in the right panel). For the nominator, 'family business assets' (which are partially movable and partially immovable) are interpreted as movable assets. Allocating family businesses to the immovable category would have a negligible impact on the results, as family businesses (as an inheritance tax category) are even for the top 1% – relatively speaking – not too important in the inheritance flow. **Source:** Own calculations based on Statbel microdata and administrative inheritance and gift microdata.

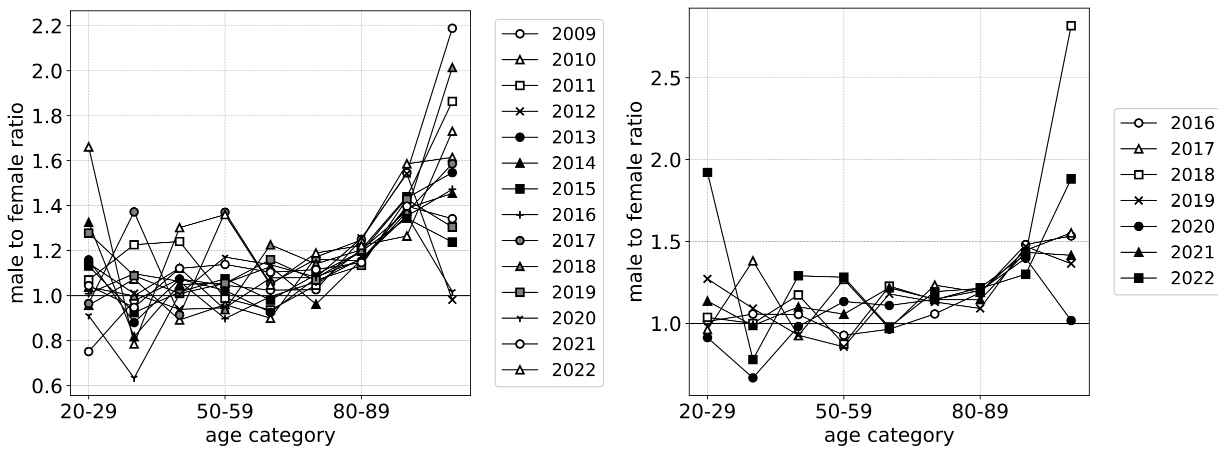

Figure O.4: Average net wealth of men relative to average net wealth of women across age categories, based on inheritance-only data (left) and including gifts up to 3 years before death (right), naive differential weights. This figure depicts the average net wealth held by men at death relative to average net wealth held by a woman within each age category. **Source:** Own calculations based on Statbel microdata and administrative inheritance and gift microdata.

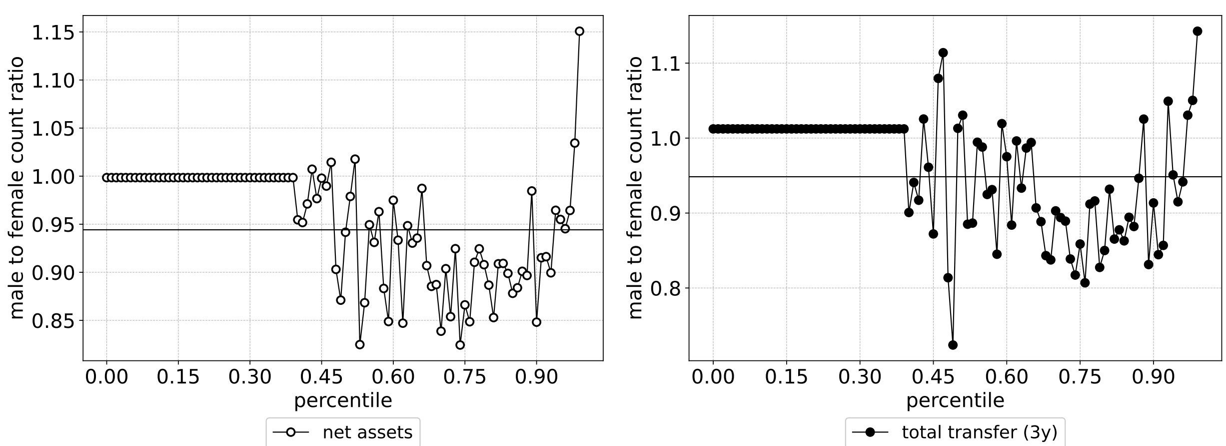

Figure O.5: Number of men divided by number of women per percentile, for inheritance-only estimates (2009-2022 average, left) and including gifts up to 3 years before death (2016-2022 average, right), naive differential weights. This figure depicts the number of men in a percentile divided by the number of women in that percentile. The horizontal black line indicates the total number of men divided by the total number of women, across all percentiles. **Source:** Own calculations based on Statbel microdata and administrative inheritance and gift microdata.

O.2 'Data-driven' weights

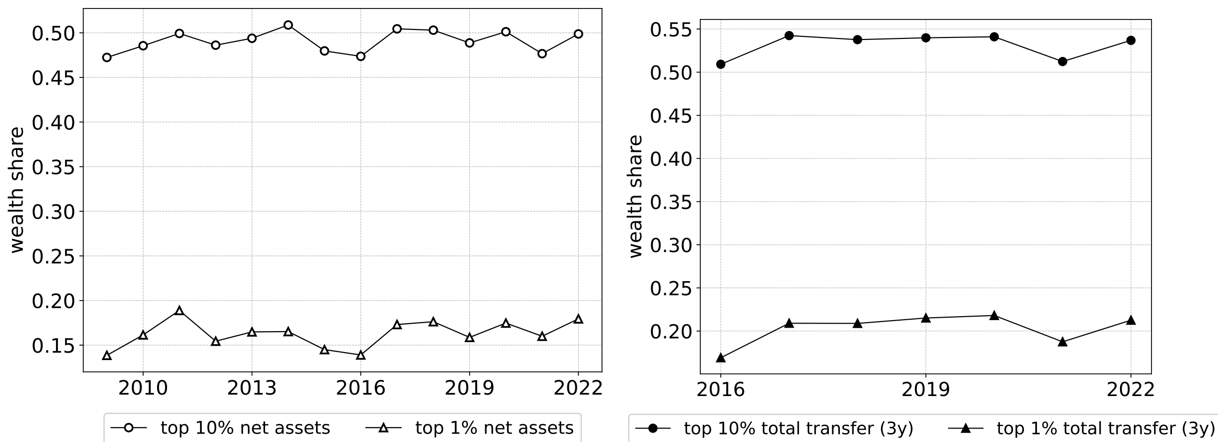

Figure O.6: Machine learning differential mortality multiplier top 1% and top 10% wealth share estimates for Belgium, inheritance only (left) and including gifts up to 3 years before death (right), 2009-2022. This figure depicts the evolution of net wealth shares estimated using the machine learning differential mortality multiplier method. The 2009-2022 series are exclusively based on inheritance declarations ('net assets'), while the 2016-2022 series take into account 3-year pre-death gift history ('total transfer (3y)'). **Source:** Own calculations based on gift and inheritance tax microdata and Statbel microdata.

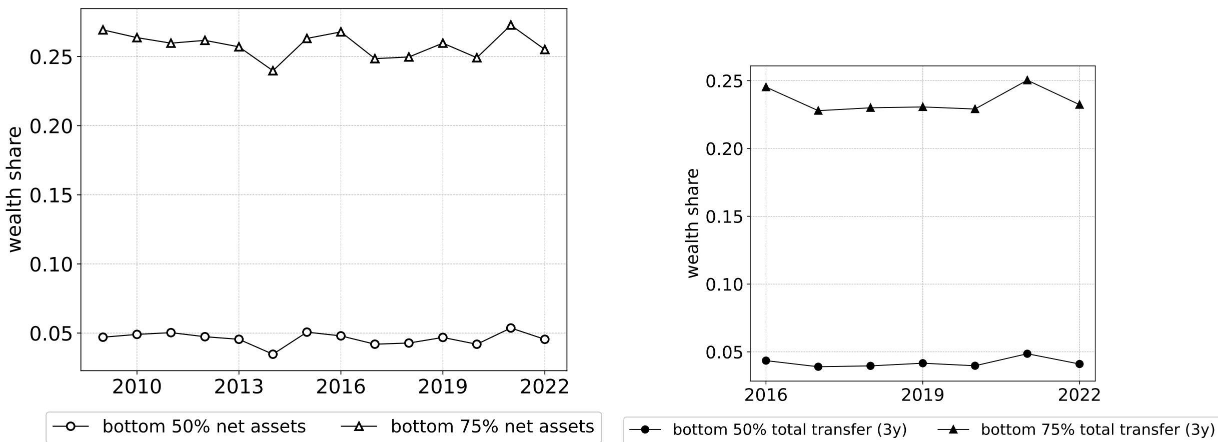

Figure O.7: Machine learning differential mortality multiplier bottom 50% and 75% wealth share estimates for Belgium, inheritance only (left) and including gifts up to 3 years before death (right), 2009-2022. This figure depicts the evolution of net wealth shares estimated using the machine learning differential mortality multiplier method. The 2009-2022 series are exclusively based on inheritance declarations ('net assets'), while the 2016-2022 series take into account 3-year pre-death gift history ('total transfer (3y)'). **Source:** Own calculations based on gift and inheritance tax microdata and Statbel microdata.

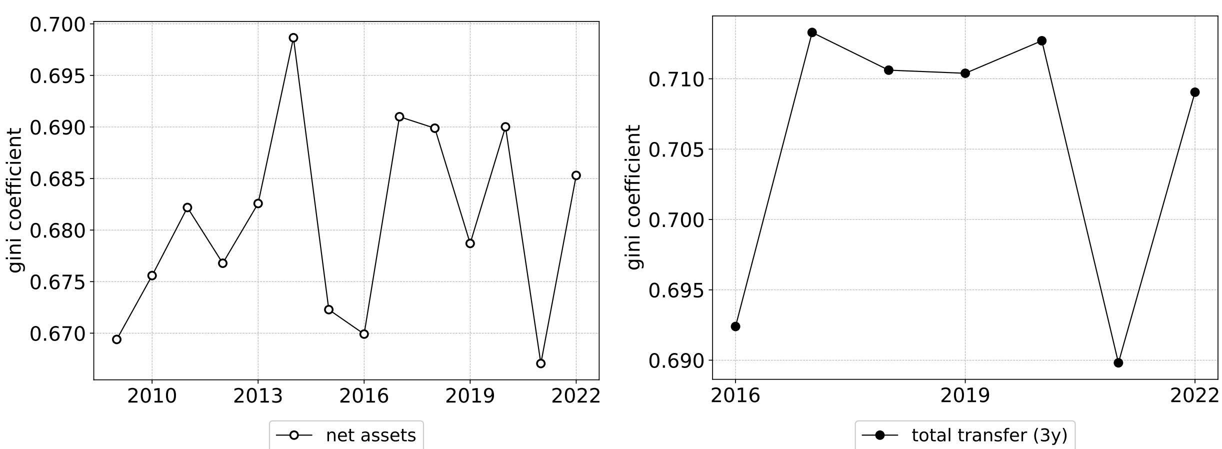

Figure O.8: Machine learning differential mortality multiplier gini coefficient estimates for Belgium, inheritance only (left) and including gifts up to 3 years before death (right), 2009-2022. This figure depicts the evolution of gini coefficients estimated using the machine learning differential mortality multiplier method. The 2009-2022 series are exclusively based on inheritance declarations ('net assets'), while the 2016-2022 series take into account 3-year pre-death gift history ('total transfer (3y)'). **Source:** Own calculations based on gift and inheritance tax microdata and Statbel microdata.

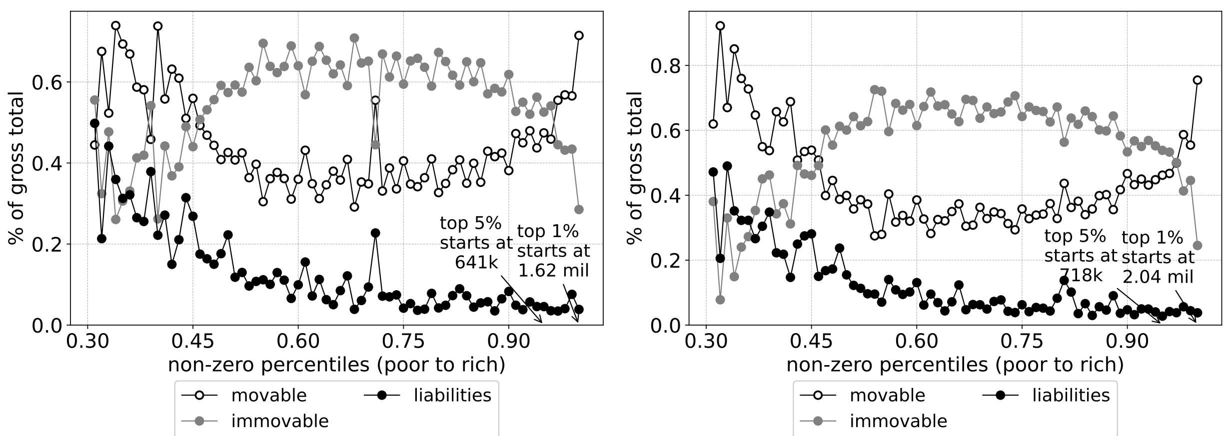

Figure O.9: Asset decomposition for 2022 living adult population by percentile of net assets in movable and immovable assets and liabilities as a share of gross assets, only inheritance data (left) and including gifts up to 3 years before death (right), machine learning differential weights. This figure depicts the asset composition by percentile for individuals with non-zero net wealth. The denominator consists of gross (i.e. without taking debt into account) assets (including gifts up to 3 years before death in the right panel). For the nominator, 'family business assets' (which are partially movable and partially immovable) are interpreted as movable assets. Allocating family businesses to the immovable category would have a negligible impact on the results, as family businesses (as an inheritance tax category) are even for the top 1% – relatively speaking – not too important in the inheritance flow. **Source:** Own calculations based on Statbel microdata and administrative inheritance and gift microdata.

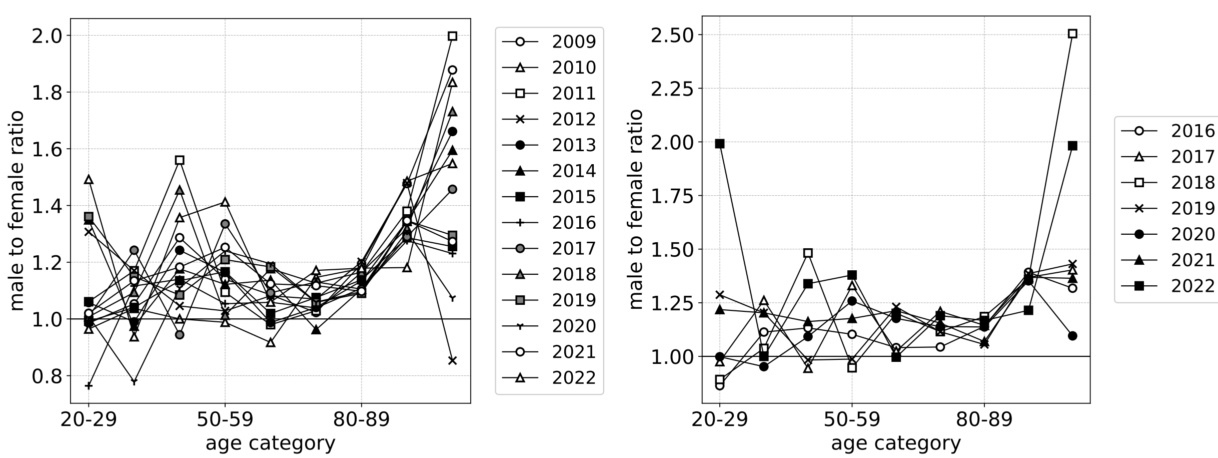

Figure O.10: Average net wealth of men relative to average net wealth of women across age categories, based on inheritance-only data (left) and including gifts up to 3 years before death (right), machine learning differential weights. This figure depicts the average net wealth held by men at death relative to average net wealth held by a woman within each age category. **Source:** Own calculations based on Statbel microdata and administrative inheritance and gift microdata.

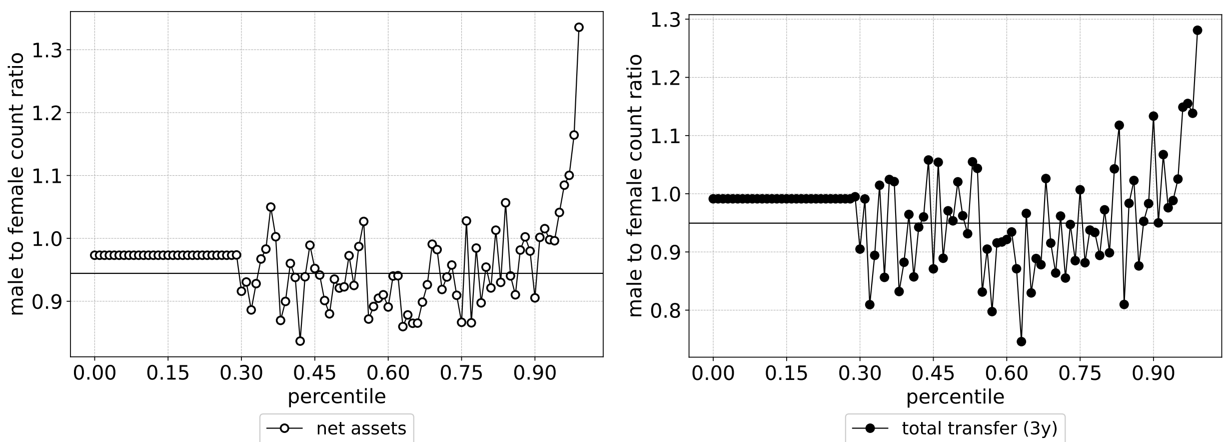

Figure O.11: Number of men divided by number of women per percentile, for inheritance-only estimates (2009-2022 average, left) and 3y-back gift correction (2016-2022 average, right), machine learning differential weights. This figure depicts the number of men in a percentile divided by the number of women in that percentile. The horizontal black line indicates the total number of men divided by the total number of women, across all percentiles. **Source:** Own calculations based on Statbel microdata and administrative inheritance and gift microdata.

Appendix P: Correcting for offshore wealth

Here I explain how offshore wealth can be taken into account in the wealth distribution estimates. Based on the evidence discussed in Appendix C, I construct three different series of offshore wealth:

- **Only undeclared + reduced offshore wealth (baseline).** The offshore-wealth-to-GDP ratio is assumed constant over time, and 90% of offshore financial wealth and 75% of offshore real estate are considered to be undeclared. From 2017 onwards, offshore financial wealth is reduced with 70%. All offshore wealth is allocated to the top 1% of the wealth distribution.
- **Only undeclared offshore wealth.** The offshore-wealth-to-GDP ratio is assumed constant over time, and 90% of offshore financial wealth and 75% of offshore real estate are considered to be undeclared. There is no reduction in offshore financial wealth due to the automatic exchange of information. All offshore wealth is allocated to the top 1% of the wealth distribution.
- **All offshore wealth.** The offshore-wealth-to-GDP ratio is assumed constant over time. There is no correction for any declared offshore wealth or for a reduction in offshore financial wealth due to the automatic exchange of information. All offshore wealth is allocated to the top 1% of the wealth distribution.

Given the limited amount of work on offshore wealth and considerable data limitations, the offshore-wealth-corrected series I construct come with high uncertainty. The baseline series may be too conservative if Belgian residents evade more than their Scandinavian counterparts and/or if the Belgian tax administration is less effective in handling the automately exchanged information on financial assets.

The baseline series are given in Figure 6, while the undeclared series and the total series are given in Figure P.1, left panel and right panel respectively. Even the total offshore wealth series leads to moderate upward corrections in the top 1% wealth share.

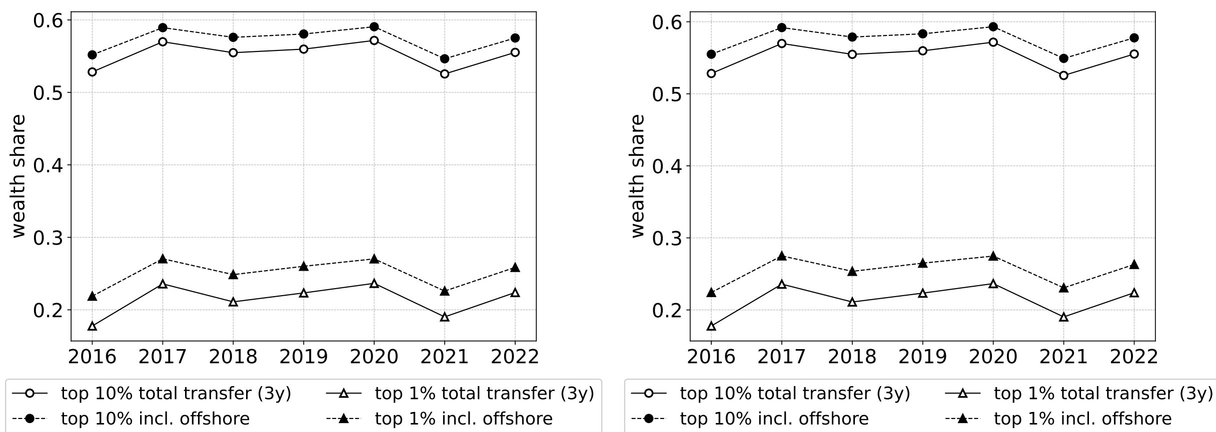

Figure P.1: Baseline differential mortality multiplier top 1% and 10% wealth share estimates for Belgium, including gifts up to 3 years before death and a correction for undeclared offshore wealth (left) and total offshore wealth (right), 2016-2022. This figure depicts the evolution of net wealth shares estimated using the baseline differential mortality multiplier method. The series takes into account 3-year pre-death gift history ('total transfer (3y)') and corrects for estimated undeclared offshore wealth. **Source:** Own calculations based on Statbel microdata, administrative inheritance and gift microdata, and offshore wealth estimates by Alstadsæter et al. (2018, 2019) and Boas et al. (2024).

Appendix Q: Alternative estimates of immovable property are noticeably lower than in the Belgian national accounts

The immovable property aggregate in the national accounts is considerably higher than the immovable property aggregate implied by a recent study on Belgian housing (Domenech-Arumi and Gobbi 2023). Domenech-Arumi and Gobbi (2023) estimate the value of housing parcels (dwellings and land underlying dwellings) from detailed cadastral information[98] and the universe of Belgian property transactions for 2006-2022 using a machine learning approach. In contrast, the national accounts aggregate is estimated using microdata on parcels held by legal entities which is made representative for all parcels in Belgium through weighting (NBB 2018).[99] For those parcels in the microdata only the parcel category, cadastral income value, region, and the transaction price at 6 percentiles of the cadastral income distribution were used in the national bank's estimation procedure. Moreover, the NBB (2018) approximates parcel values between percentiles using linear interpolation.[100]

The Domenech-Arumi and Gobbi (2023) estimates are not directly comparable to the published national accounts aggregates. The reason for this is that Domenech-Arumi and Gobbi (2023) estimate the value of housing parcels (dwellings and land underlying dwellings) regardless of macroeconomic sector while the national accounts only report land underlying dwelling for the household sector (dwelling aggregates are available for each sector). To correct for this, I adjust national accounts aggregates by assuming a constant fraction of land to housing value across macroeconomic sectors. The Domenech-Arumi and Gobbi (2023) estimates add up to only between 65-75% of this adjusted national accounts counterpart (Figure Q.1).

In addition to the Domenech-Arumi and Gobbi (2023) estimates, one can also consider the aggregate weighted wealth transfer data as a relevant information point in itself.[101] In principle, it should be close to the national accounts aggregate given that all transfers of immovable property are legally subject to registration in Belgium.[102] Instead, the inheritance-and-gift-based total corresponds to only around 50-60% of its national accounts counterpart (Figure Q.1).

Both of the above-mentioned alternative sources rely on a completely different approach. The finding that the transaction-based valuation approach in Domenech-Arumi and Gobbi (2023) leads to a higher estimated housing aggregate than my transfer-based valuation approach should not be suprising, given the incentive towards undervaluation for tax purposes.

[98] 40 dwelling and location related variables were used for training.

[99] The value of land and housing is estimated jointly at the parcel level, and then the PIM value for housing is subtracted from the estimated value of the parcel to back out the value of the underlying land. Hence, for the purpose of this appendix, the PIM estimation method does not matter.

[100] Although with a correction of the transaction prices at the top of the distribution and a correction for ownership category within region and parcel category pairs.

[101] Although of course not for the purpose of triangulating the inheritance tax approach.

[102] In contrast to movable property for which unregistered gifts are possible.

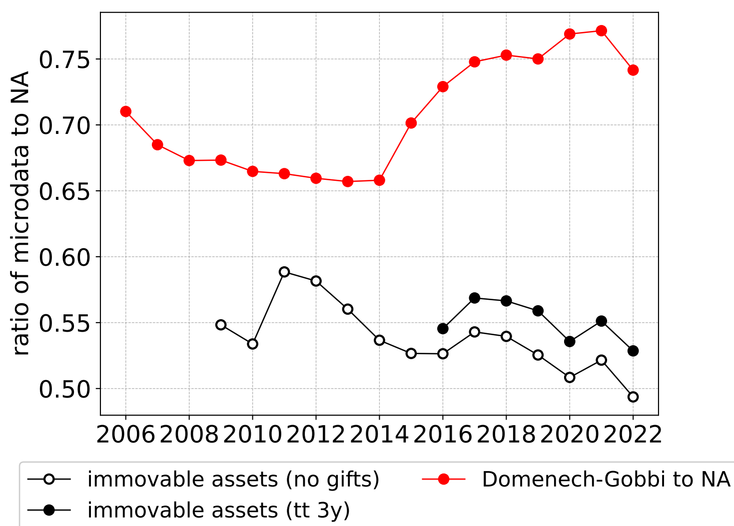

Figure Q.1: Aggregate immovable assets implied by baseline differential reweighting and aggregate housing parcel values relative to comparable national accounts aggregates. This plot depicts the aggregated value of dwellings and land underlying dwelling from Domenech-Arumi and Gobbi (2023) and weigthed inheritance data relative to comparable national accounts aggregates. **Source:** Own calculations based on administrative inheritance and gift microdata, Statbel microdata, national accounts aggregates from the NBB, and aggregate estimates from Domenech-Arumi and Gobbi (2023).

Appendix R: Detailed explanation of comparison between national accounts and reweighted microdata

Comparison of the inheritance-based wealth estimates with national accounts aggregates is not entirely straightforward. First, concepts differ. The inheritance tax data is subdivided into 'movable', 'immovable', 'family home', and 'family business' asset and liabilities categories. The national accounts are subdivided into 'financial' and 'non-financial' wealth. Overall, there might be a large overlap between 'movable' and 'financial' wealth, and 'immovable' and 'non-financial' wealth. The overlap is not complete, since for example certain subcategories of non-financial wealth are clearly movable property. Moreover, while 'family home' can uncontroversially be interpreted as 'non-financial', it is more challenging to classify 'family business' assets. A business might not be set up as separate legal entity and in that case real assets would be captured by 'non-financial' wealth in the national accounts.

A second issue is that the inheritance tax data do not fully capture net assets. Inheritances with negative net wealth are not captured in the Flemish microdata, as no inheritance declaration is required (in the microdata such inheritances are classified as zero net wealth inheritances). Furthermore, mortgages are often accompanied by a life insurance corresponding to the outstanding mortgage amount ('schuldsaldoverzekering'). In the case of death, the life insurance pays out the creditor and the mortgage would not be recorded as a liability in the inheritance tax data.[103] Moreover, only registered gifts are recorded in the microdata. While registration is mandatory for immovable assets, movable assets can be gifted without registration and will thus not be fully captured.[104]

Conversely, a third issue is that the national accounts do not entirely capture net wealth. Most notably durable consumption goods (e.g. cars) and valuables (e.g. jewelry) are not included in the national accounts. In their seminal work on the Belgian wealth distribution in 1969, Frank et al. (1978) estimate car wealth by combining the number of privately owned cars by their average sales prices, while they estimate other durable consumption goods by combining budget survey evidence with depreciation rates. In total durable consumption goods make up 7% of their private net wealth estimate. For privately-owned valuables, Frank et al. (1978) assume that it corresponds to 3.4% of private net wealth.[105] According to them, this assumption is 'certainly' an underestimate, but no motivation is given.

Fourth, in the case of inheritances there is a clear incentive to undervalue assets. In the Flemish case, around 70% of real assets are valued by beneficiaries themselves. Clearly these assets may be undervalued. According to the administration, around 2% of self-valued real assets are undervalued but that is likely an underestimate, as a wide range of valuation methods are accepted.[106] In the case of financial investment assets, beneficiaries can choose the valuation moment themselves from the following three options: (1) moment of death; (2) one month later; (3) two months later. This will no doubt result in a (small) undervaluation of financial assets. Alvaredo et al. (2018) note that a substantial part of the difference between UK national accounts aggregates and reweighted

[103] As discussed previously in Section 3.1.

[104] As explained in more detail in Appendix A.

[105] More precisely, 4% of private wealth not directly used for business purposes (so including financial wealth).

[106] In fact, over a 100 different valuation methods are considered acceptable. Moreover, note that Frank et al. (1978) assume that property transactions are undervalued by 20% in property transactions due to tax fraud.

UK inheritance data is due to valuation differences. Raub et al. (2010) similarly point out that valuation in the context of US inheritance tax returns is likely conservative, given the incentive towards low valuation. Similarly, in his work on the Belgian inheritance tax gap, Frank (1973) allocates the entire discrepancy between reweigthed inheritance data and macroeconomic private net wealth estimates to tax avoidance and evasion.

Fifth, the target population of the national accounts is the entire resident population (EGMM 2020), while the baseline estimates in this paper exclude children.

Lastly, one should note that national accounts aggregates are valued at market prices at the end of the applicable book year. Hence, there might be some differences in the valuation reference moment between national accounts aggregates and inheritance-based aggregates (an issue also noted by Alvaredo et al. 2018).

Given the above mentioned constraints, in what follows I explain in detail how national accounts aggregates and microdata were compared.

First, I allocate microdata asset categories to broader categories that are comparable with the adjusted national accounts (Table R.1). Immovable assets make up 54% of total net assets, while movable assets represent around 55%. Liabilities correspond to 10% of total net assets.

Table R.1: Correspondence table between microdata categories and asset categories used for national accounts comparison

Comparison asset category	Microdata asset category	% of total net assets	
		inheritance-only (2009-2022 average)	3y-gift-correction (2016-2022 average)
Movable	Movable	50	53
	Family business	2	2[1]
Immovable	Immovable	31	30
	Family home	28	24[1]
Liabilities	Liabilities	11	10[1]

[1] These categories are not included in the gift data, so their nominal amount does not change.
Source: Own calculations based on Statbel microdata and administrative inheritance and gift microdata.

Second, I allocate national accounts aggregates to broader categories as required for the comparison (Table R.2). With respect to national accounts aggregates classified as movable assets, three categories stand out based on their share of total net wealth. Non-transferable deposits (e.g. 'spaarrekeningen') correspond to around 13% of net private wealth, equity and investment fund shares/units make up 24% of net private wealth, and life insurance and annuity entitlements amount to 8% of total net private wealth. Notable immovable asset categories are dwellings (22% of net wealth) and land (36% of net wealth). Liabilities are mostly made up of loans, corresponding to around 12% of net private wealth.

One drawback of the national accounts data is that for some categories (see Table R.2), there is no series available that separates non-profit institutions serving households (NPISH) from households. The NBB is unable to provide series where non-profit institutions are filtered out, but informed me that the NPISH share amounts to on average 1% of the total in these categories.

Three national accounts asset categories are excluded (Table R.3). Currency will likely remain largely uncaptured in the inheritance tax data. Pension entitlements might sometimes be captured, if the pension fund pays out (sometimes partially) to the inheritors as a result of the death of the beneficiary. Non-life insurance technical reserves include provisions for future expected pay-outs by insurance companies, and are not captured in the inheritance data.

Table R.2: Correspondence table between national account categories and asset categories used for national accounts comparison

Comparison asset category	NA category[1]	NA sector[2]	Description	% of NA total[3] (2009-2022 average)
Movable	F22	S14	Transferable deposits	3
	F29	S14	Other deposits	13
	F3	S14	Debt securities	3
	F4	S14	Loans (asset)	0
	F5	S14	Equity and investment fund shares/units	24
	F62	S14	Life insurance and annuity entitlements	8
	F7	S14	Financial derivatives and employee stock options	0
	F81	S14	Trade credits and advances	0
	F89	S14	Other accounts receivable/payable, excluding trade credits and advances	0
	AN3A	S14_15	Machinery and equipment + Weapons systems	0
	AN8	S14_15	Cultivated biological resources[4]	0
	AN9	S14_15	Intellectual property products	0
	AN15	S14_15	Inventories	0
Immovable	AN1	S14_15	Dwellings	22
	AN2A	S14_15	Buildings other than dwellings	1
	AN2B	S14_15	Other structures	0
	AN21000	S14_15	Land	36
Liabilities	F4	S14	Loans	12
	F7	S14	Financial derivatives and employee stock options	0
	F81	S14	Trade credits and advances	0
	F89	S14	Other accounts receivable/payable, excluding trade credits and advances	0

[1] The asset category refers to the NBB's asset classification. See Eurostat (2013) ESA2010 manual for a detailed description of these asset categories. Note that in some cases the NBB's naming convention differs from the ESA2010 classifications.
[2] S14 sector is households only, S14_15 includes non-profit institutions serving households.
[3] NA total includes all net private wealth (so also the NA categories excluded in the comparison).
[4] This category consists of animals and non-animals, and the former are classified as tangible whereas the latter are intangible under Belgian law. The NBB is not able to supply a decomposition of the series, but informed me that animals amount to 85% of this category on average, hence the classification as 'movable'.

Source: Own calculations based on NBB national accounts data.

Table R.3: Correspondence table between national account categories and asset categories used for national accounts comparison

Comparison asset category	NA category[1]	Description	Exclusion criterion	% of NA total[2] (2009-2022 average)
Movable	F21	Currency	Likely largely uncaptured due to tax evasion	1
	F6M	Pension entitlements	Largely uncaptured (depends on legal conditions)	4
	F6O	Non-life insurance technical reserves	Entirely uncaptured, expected future reimbursements of insurance companies are not included in inheritance data	1

[1] The asset category refers to the NBB's asset classification. See Eurostat (2013) ESA2010 manual for a detailed description of these asset categories. Note that in some cases the NBB's naming convention differs from the ESA2010 classifications.

[2] NA total includes all net private wealth (so also the NA categories excluded in the comparison).

Source: Own calculations based on NBB national accounts data.

Appendix S: Additional graphs

Here a number of additional graphs referenced in the text are presented.

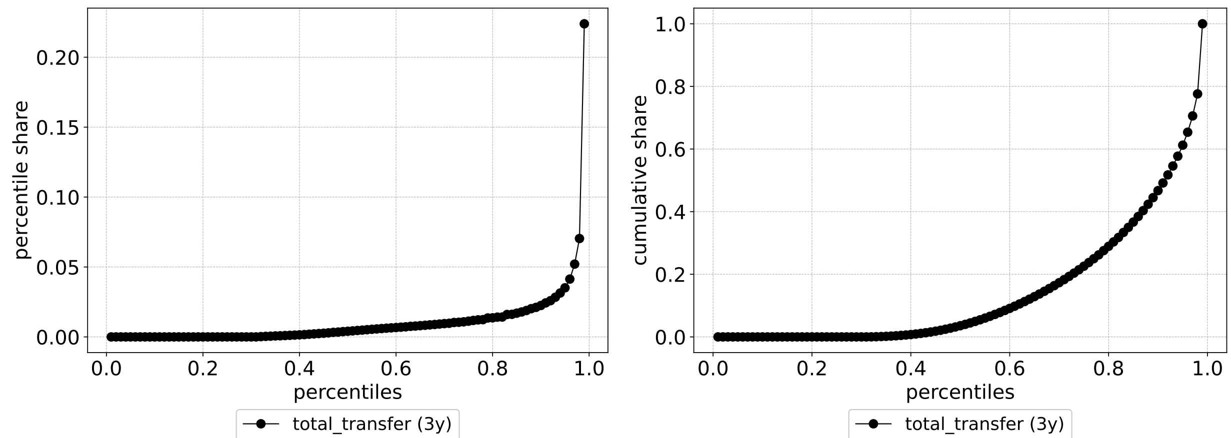

Figure S.1: Actual (left panel) and cumulative (right panel) estimated distribution of net wealth in Belgium, 2022. The figure is based on the baseline differential weighting approach and includes gifts up to 3 year before death. The left panel shows the share of net wealth held by each percentile of the distribution, while the right panel shows the share held by each percentile as well as all percentiles that are lower in the distribution. **Source:** Own calculations based on Statbel microdata and administrative inheritance and gift tax data.

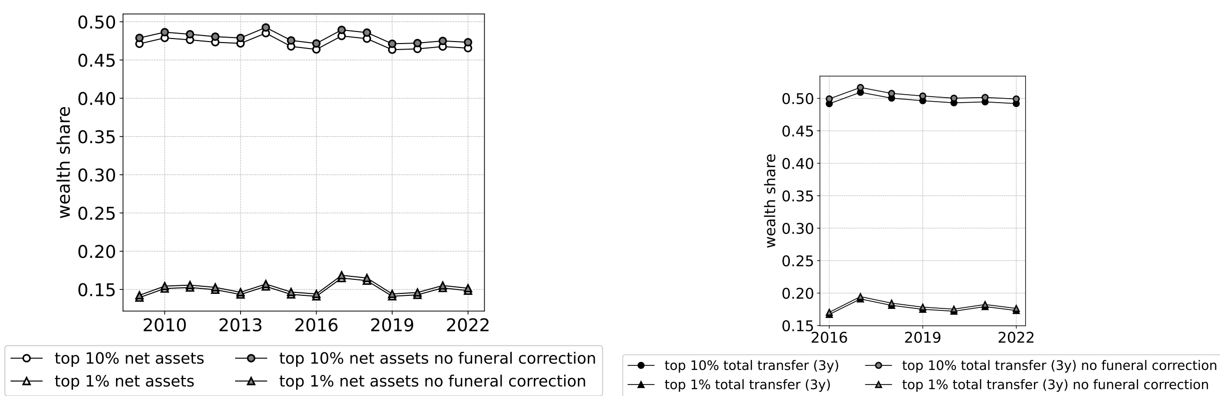

Figure S.2: Mean mortality multiplier top 1% and top 10% wealth share estimates, with and without correction for funeral costs, net assets (left) and including gifts up to 3 years before death (right). In the baseline mean mortality multiplier series, I correct for the inclusion of funeral costs in the 21st century. The figure above shows that the impact of this correction is negligible. **Source:** Own calculations based on administrative inheritance and gift tax data.

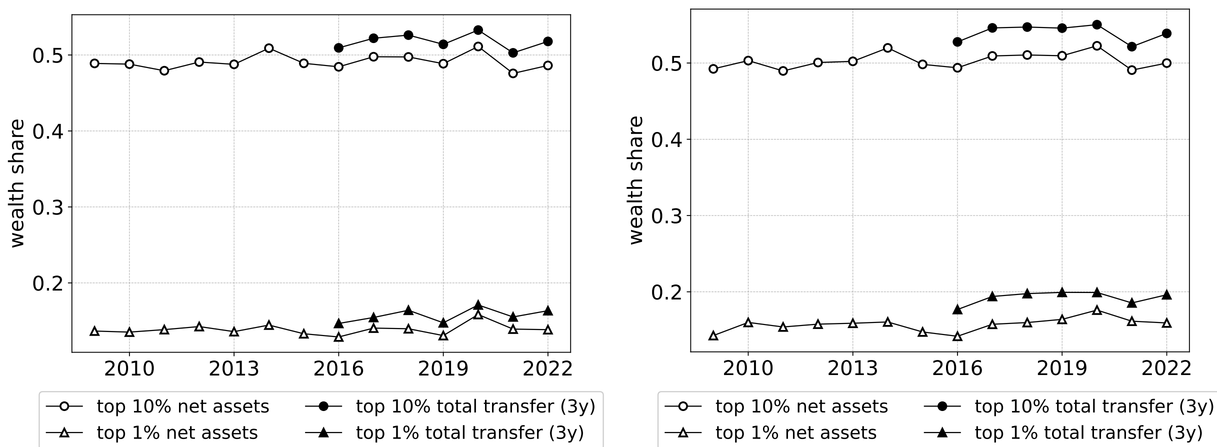

Figure S.3: Baseline differential mortality multipliers excluding observation with net wealth above 10 million euros (left panel) and 50 million euros (right panel), top 1% and top 10% wealth share estimates, 2009-2022. The above figures indicate that sampling variability at the top of the distribution is responsible for the variability in top wealth shares, since the above series are more stable than the baseline series. **Source:** Own calculations based on administrative inheritance and gift tax data.

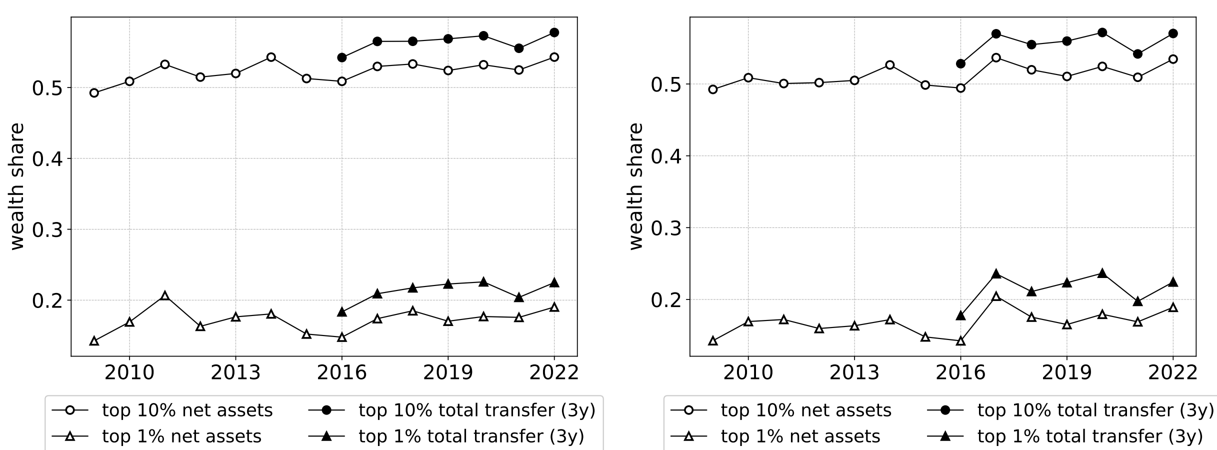

Figure S.4: Baseline differential mortality multipliers using 2001 census data for post-2010 period (left panel) and 2011 census data for post-2020 period (right panel), top 1% and top 10% wealth share estimates, 2009-2022. The above figures indicate that switches between census years do not substantially impact the estimates. The baseline series (2001 census data for 2009-2010, 2011 census data for 2011-2020, 2021 census data for 2021-2022) always makes us of the most recent available census dataset. **Source:** Own calculations based on administrative inheritance and gift tax data.

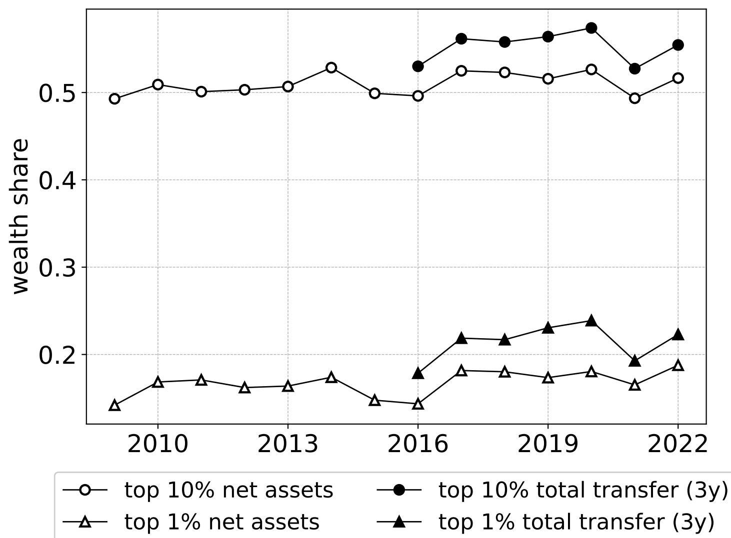

Figure S.5: Differential mortality multipliers accounting for citizenship status, top 1% and top 10% wealth share estimates, 2009-2022. Differential weights here include all categories in the baseline differential weights (gender, age, region, socio-economic status) and additionally include citizenship status (Belgian/non-Belgian). Neither trend nor level seems to be affected, indicating that the baseline weighting scheme is not impacted by possible differences in mortality trends by citizenship status. **Source:** Own calculations based on administrative inheritance and gift tax data.

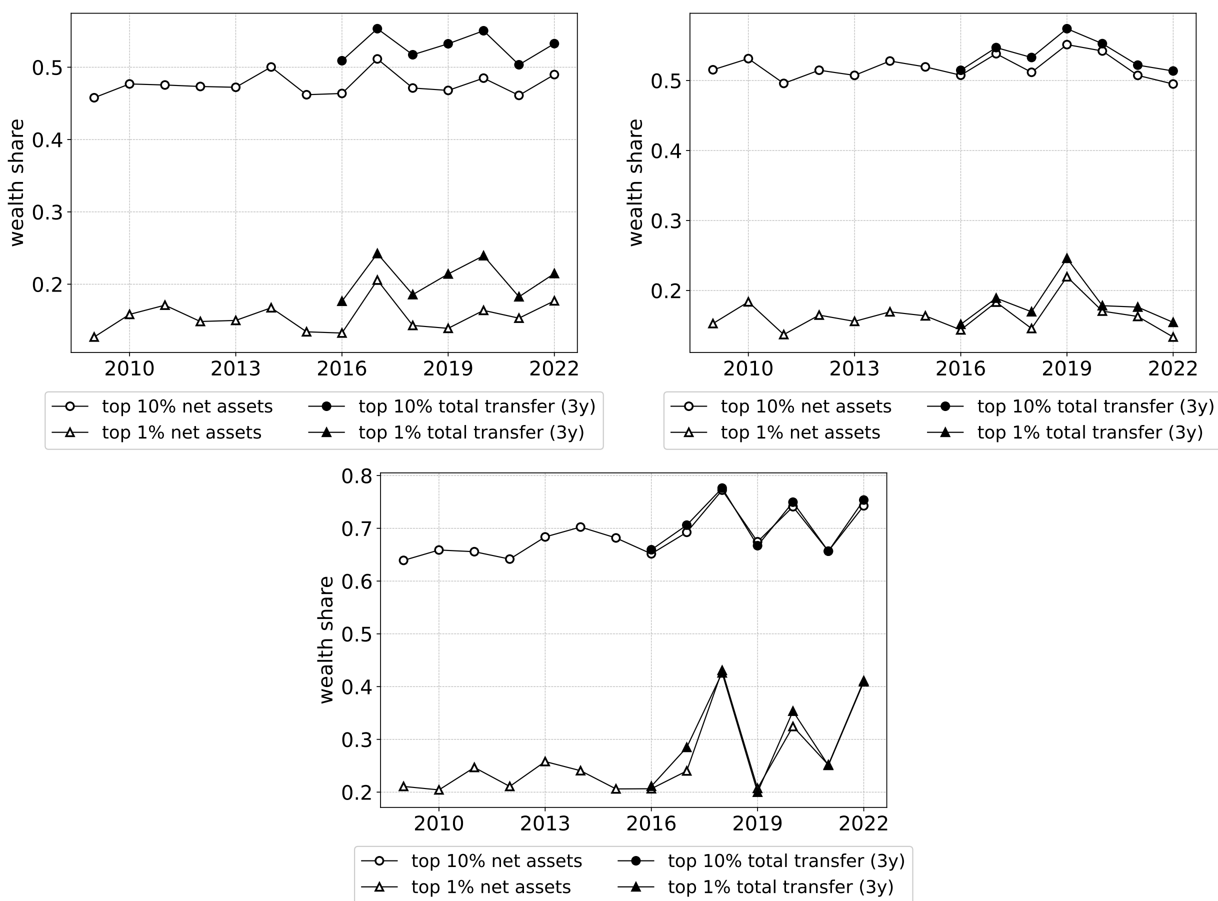

Figure S.6: Baseline differential mortality multiplier top 1% and top 10% wealth share estimates for Flanders (upper left) Wallonia (upper right) and Brussels (bottom), 2009-2022. The top x% share refers to the net wealth share among the x% richest individuals in each region. The 2009-2022 series is exclusively based on inheritance declarations ('net assets'), while the 2016-2022 series takes into account 3-year pre-death gift history ('total transfer (3y)'). **Source:** Own calculations based on Statbel microdata and administrative inheritance and gift microdata.

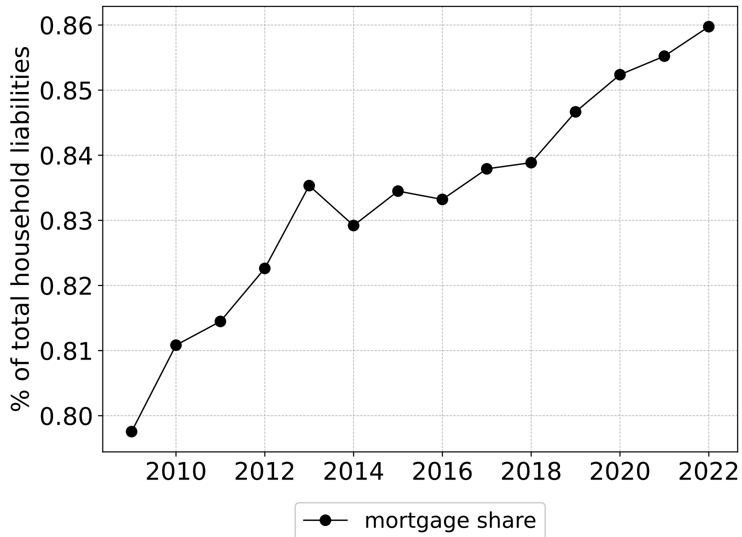

Figure S.7: Share of mortgages in total household liabilities, 2009-2022. This figure shows the proportion of mortages in total liabilities of the household sector. **Source:** Own calculations based on NBB national accounts data.

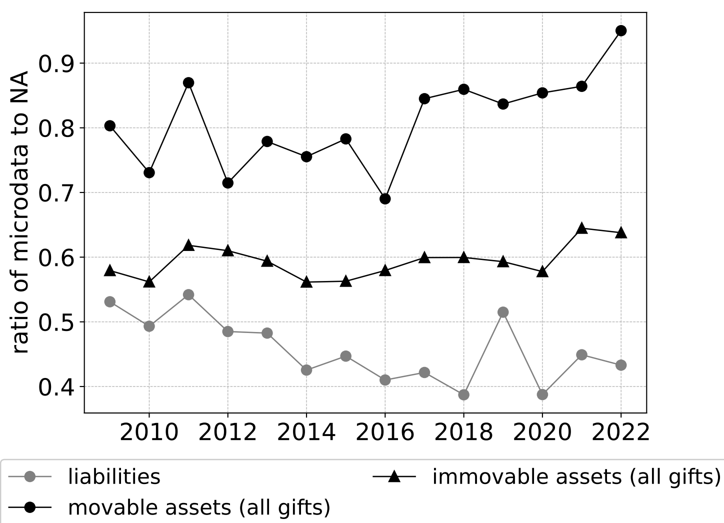

Figure S.8: Aggregate net wealth implied by baseline differential reweighting relative to comparable national accounts aggregates, including children and entire gift history, 2009-2022. This figure shows the extent to which reweighted (gift-corrected) net inheritance data sum up to national accounts aggregates. Pre-2013 movable gifts are included here, after data cleaning. **Source:** Own calculations based on Statbel microdata, NBB national accounts data, and administrative inheritance and gift microdata.

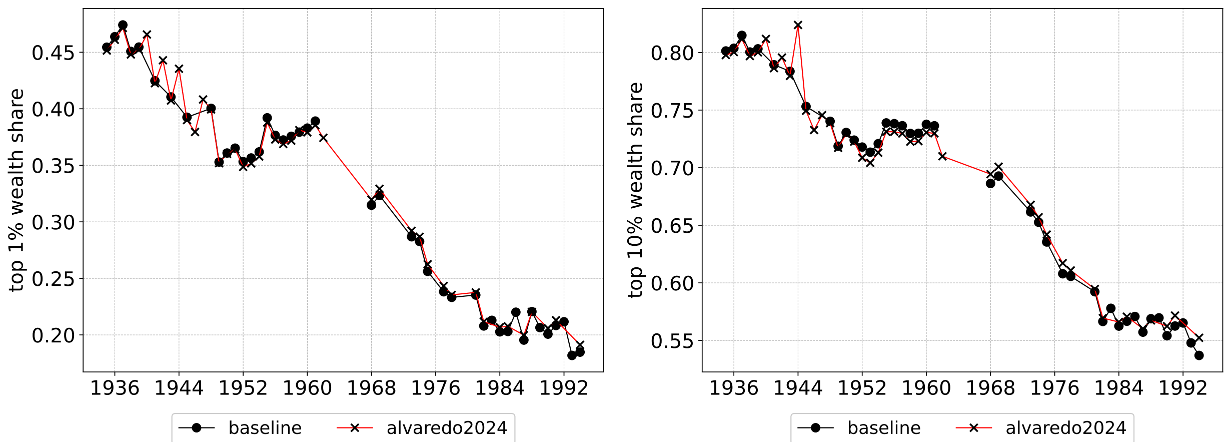

Figure S.9: Top 1% (left) and 10% (right) estimated wealth shares without correcting for net wealth of the non-included and gross tabulations from 1968 onwards compared to Alvaredo et al series, 1900-1999. Here I compare the estimates provided by Alvaredo et al. (2024) with my series. To ensure comparability, I assume that non-included decedents have zero net wealth and I do not correct for the fact that tabulations are by gross rather than net assets from 1968 onwards. The two series are extremely similar, which suggests that these two corrections do indeed explain the difference between my baseline and the Alvaredo et al. (2024) estimates for the 20th century. The remaining small differences may be due to the interpolation techniques employed. Note that I drop certain years in my sample, as argued for in Section 3.1. **Source:** Own calculations based on HMD mortality tables and inheritance tax tabulations.

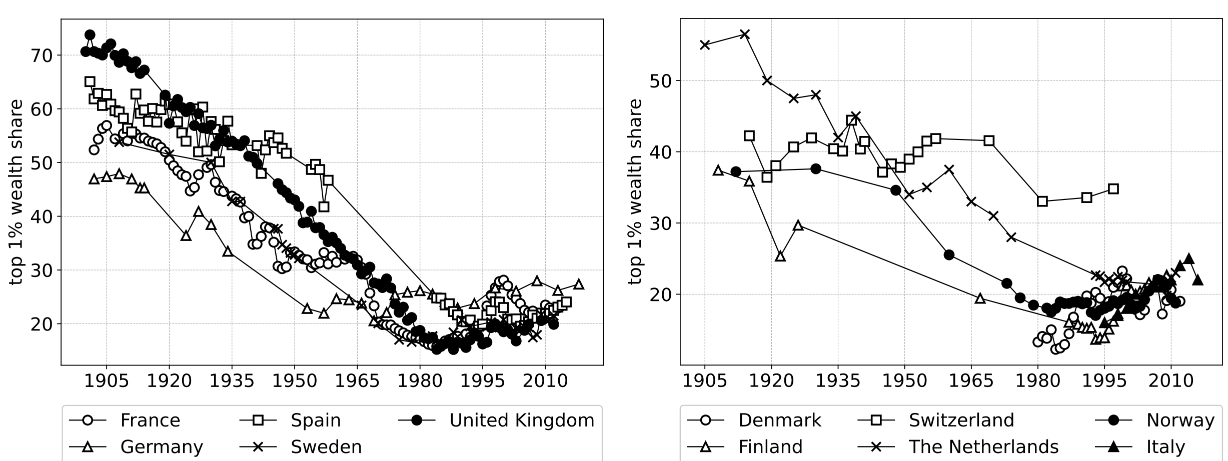

Figure S.10: Top 1% wealth shares for European countries, 1900-1999. Countries are randomly distributed between the left and right panel for readibility. France: Garbinti et al. (2021), Piketty et al. (2006). Spain: Alvaredo and Artola Blanco (2023) for 1901-58 and Martínez-Toledano (2020) for 1984-2015. UK: Alvaredo et al. (2018). Germany: Albers et al. (2022). Sweden: Lundberg and Waldenström (2018) and Roine and Waldenström (2009). Denmark: Jakobsen et al. (2020). Italy: Acciari et al. (2024) (WP version). Switzerland, Norway, Finland, and The Netherlands: various sources discussed in Roine and Waldenström (2015). **Source:** Data brought together by Waldenström (2024).

Appendix T: Data tables

Table T.1: Top 1% and top 10% wealth shares, baseline non-inclusion and gross-to-net corrections, 1935-1994

year	top 1%	top 10%
1935	41.09	72.47
1936	41.93	72.67
1937	42.76	73.50
1938	40.91	72.64
1939	40.77	72.04
1941	38.52	71.59
1943	37.37	71.36
1945	36.29	69.65
1948	37.85	69.98
1949	33.05	67.32
1950	33.72	68.27
1951	33.99	67.38
1952	32.97	67.00
1953	33.36	66.77
1954	33.46	66.66
1955	36.01	67.88
1956	34.42	67.50
1957	33.94	67.12
1958	34.71	67.42
1959	35.08	67.50
1960	34.98	67.39
1961	35.67	67.51
1968	29.53	64.01
1969	30.31	64.34
1973	27.15	61.98
1974	26.67	61.25
1975	24.38	59.91
1977	22.67	57.63
1978	21.98	57.20
1981	22.28	56.07
1982	19.77	53.77
1983	20.22	54.84
1984	19.47	53.81
1985	19.50	54.13
1986	21.11	54.60
1987	18.92	53.52
1988	20.73	54.31
1989	19.75	54.29
1990	19.44	53.51
1991	20.03	54.08
1992	20.50	54.46
1993	17.66	52.80
1994	18.09	52.22

Source: Own calculations based on HMD mortality tables and inheritance tax tabulations.

Table T.2: Top 1% and top 10% wealth shares, baseline mean mortality weighted estimates, inheritance only, 2009-2022

year	top 1%	top 10%
2009	13.94	47.12
2010	15.12	47.89
2011	15.25	47.63
2012	14.97	47.33
2013	14.34	47.17
2014	15.39	48.51
2015	14.35	46.78
2016	14.10	46.39
2017	16.50	48.14
2018	16.15	47.79
2019	14.11	46.35
2020	14.30	46.45
2021	15.20	46.76
2022	14.84	46.55

Source: Own calculations based on Statbel microdata and administrative inheritance and gift tax data.

Table T.3: Top 1% and top 10% wealth shares, baseline mean mortality weighted estimates, including gifts up to 3 years before death, 2016-2022

year	top 1%	top 10%
2016	16.71	49.17
2017	19.09	50.93
2018	18.11	50.03
2019	17.50	49.64
2020	17.21	49.31
2021	17.92	49.46
2022	17.32	49.20

Source: Own calculations based on Statbel microdata and administrative inheritance and gift tax data.

Table T.4: Top 1% and top 10% wealth shares, threshold values (2022 euros) and gini coefficient, baseline differentialy weighted estimates, including gifts up to 3 years before death, 2016-2022

year	top 1%	threshold 1%	top 10%	threshold 10%	gini
2016	17.77	1651400	52.82	454699	0.71
2017	23.58	1891091	56.99	474968	0.74
2018	21.10	1846085	55.48	475458	0.73
2019	22.33	1802063	55.97	480642	0.73
2020	23.65	1960363	57.17	480208	0.74
2021	19.03	2055579	52.55	521999	0.70
2022	22.39	2069276	55.52	515218	0.73

Source: Own calculations based on Statbel microdata and administrative inheritance and gift tax data.

Table T.5: Bottom 75% and bottom 50% wealth share, threshold values (2022 euros) and gini coefficient baseline differentialy weighted estimates, including gifts up to 3 years before death, 2016-2022

year	bottom 75%	threshold 75%	bottom 50%	threshold 50%	gini
2016	22.26	232182	2.94	76239	0.71
2017	20.17	239485	2.52	76467	0.74
2018	20.89	238452	2.67	77025	0.73
2019	20.75	240725	2.69	78836	0.73
2020	19.68	240668	2.22	74319	0.74
2021	23.56	273938	3.90	104013	0.70
2022	21.45	262278	3.17	92435	0.73

Source: Own calculations based on Statbel microdata and administrative inheritance and gift tax data.

Table T.6: Top 1% and top 10% wealth shares, threshold values (2022 euros) and gini coefficient, baseline differentialy weighted estimates, including gifts up to 3 years before death, rescaled to national account counterparts, 2016-2022

year	top 1%	threshold 1%	top 10%	threshold 10%	gini
2016	17.57	2670913	52.42	728079	0.71
2017	22.34	2713081	55.63	689237	0.73
2018	20.48	2661446	54.69	698084	0.73
2019	21.29	2621636	54.98	722138	0.73
2020	22.09	2852763	55.75	720212	0.73
2021	18.81	2913962	52.14	749630	0.70
2022	20.92	2756373	53.95	703854	0.72

Source: Own calculations based on Statbel microdata and administrative inheritance and gift tax data.

Table T.7: Bottom 75% and bottom 50% wealth share, threshold values (2022 euros) and gini coefficient baseline differentialy weighted estimates, including gifts up to 3 years before death, rescaled to national accounts counterparts, 2016-2022

year	bottom 75%	threshold 75%	bottom 50%	threshold 50%	gini
2016	22.73	373991	3.21	131675	0.71
2017	21.08	356396	2.69	115661	0.73
2018	21.46	354911	2.75	117850	0.73
2019	21.06	369096	2.34	120295	0.73
2020	20.56	370938	2.32	115539	0.73
2021	23.93	392562	4.08	152570	0.70
2022	22.35	365438	3.22	129676	0.72

Source: Own calculations based on Statbel microdata and administrative inheritance and gift tax data.

Table T.8: Top 1% and top 10% wealth shares, threshold values (2022 euros) and gini coefficient, baseline differentialy weighted estimates, including gifts up to 3 years before death, rescaled to national account counterparts excluding immovable property, 2016-2022

year	top 1%	threshold 1%	top 10%	threshold 10%	gini
2016	20.66	2207142	56.47	529530	0.74
2017	26.74	2116760	60.08	491121	0.76
2018	23.88	2159464	58.55	493037	0.75
2019	25.45	2098852	59.21	511043	0.76
2020	27.07	2195991	60.43	489456	0.76
2021	21.68	2376611	55.49	562146	0.72
2022	24.53	2119724	57.78	504438	0.74

Source: Own calculations based on Statbel microdata and administrative inheritance and gift tax data.

Table T.9: Bottom 75% and bottom 50% wealth share, threshold values (2022 euros) and gini coefficient, baseline differentialy weighted estimates, including gifts up to 3 years before death, rescaled to national accounts counterparts excluding immovable property, 2016-2022

year	bottom 75%	threshold 75%	bottom 50%	threshold 50%	gini
2016	20.17	250013	2.90	86588	0.74
2017	18.43	235731	2.51	76468	0.76
2018	19.23	237464	2.64	80214	0.75
2019	18.74	242686	2.11	82631	0.76
2020	17.91	235107	2.17	73503	0.76
2021	21.81	277538	3.94	107067	0.72
2022	20.30	246752	3.16	88962	0.74

Source: Own calculations based on Statbel microdata and administrative inheritance and gift tax data.

Table T.10: Top 1% and top 10% wealth shares, threshold values (2022 euros) and gini coefficient, baseline differentialy weighted estimates, inheritance only, 2009-2022

year	top 1%	threshold 1%	top 10%	threshold 10%	top 20%	threshold 20%	gini
2009	14.26	1236622	49.24	391505	68.54	245746	0.69
2010	16.92	1295835	50.87	406374	69.63	250967	0.70
2011	17.21	1418030	50.06	418429	68.36	268032	0.69
2012	15.96	1447829	50.19	427244	68.91	268943	0.70
2013	16.34	1448682	50.50	423256	69.24	266562	0.70
2014	17.20	1460449	52.65	425310	71.41	259654	0.72
2015	14.79	1433460	49.85	452069	69.07	273973	0.69
2016	14.24	1399933	49.43	428123	68.91	271976	0.70
2017	20.45	1596356	53.66	444741	71.68	277295	0.72
2018	17.54	1507049	51.98	439105	70.67	274747	0.71
2019	16.51	1502159	51.05	443691	69.99	274828	0.71
2020	17.94	1566768	52.45	448887	71.28	280477	0.72
2021	16.39	1606705	49.23	486207	67.76	309630	0.69
2022	19.18	1628360	51.95	478436	70.07	300594	0.71

Source: Own calculations based on Statbel microdata and administrative inheritance and gift tax data.

Table T.11: Bottom 75% and bottom 50% wealth share, threshold values (2022 euros) and gini coefficient baseline differentialy weighted estimates, inheritance only, 2009-2022

year	bottom 75%	threshold 75%	bottom 50%	threshold 50%	gini
2009	24.37	206219	3.04	70871	0.69
2010	23.57	210186	3.02	71287	0.70
2011	24.86	225196	3.98	86709	0.69
2012	24.35	225796	3.47	82863	0.70
2013	23.95	221523	3.26	82380	0.70
2014	21.83	215621	2.20	66070	0.72
2015	24.05	228456	3.54	80315	0.69
2016	24.00	225840	3.11	73419	0.70
2017	21.79	231122	2.67	71471	0.72
2018	22.63	228645	2.86	72112	0.71
2019	23.15	230647	2.94	73307	0.71
2020	21.92	231839	2.42	69111	0.72
2021	25.35	262906	4.11	98094	0.69
2022	23.33	247344	3.37	85604	0.71

Source: Own calculations based on Statbel microdata and administrative inheritance and gift tax data.