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Missing wealth distribution, wealth inequality and anti-inequality

Michele Bavaro, Piotr R. Paradowski

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Missing wealth distribution, wealth inequality and anti-inequality policies

Michele Bavaro* Piotr R. Paradowski†

Abstract

We examine how under-reporting of financial assets in surveys biases wealth inequality measures and assessments of wealth tax progressivity. Using Luxembourg Wealth Study (LWS) microdata and national accounts (NA), we focus on financial assets, the largest survey-NA gap. We implement calibrated non-proportional cross-country statistical matching using Norway's administrative registers as a donor, preserving demographics and variables within wealth percentile cells. For Austria, Canada, and Italy, financial asset inequality increases, especially at the top. Using the Reynolds-Smolensky (RS) index, both flat and progressive tax schedules become much more redistributive, with RS (Gini) rising by about 1.6x–5.0x across countries (e.g., from 0.099 to 0.495 in Austria under the progressive tax schedule). We map LWS-NA concepts, bound business equity's effect, and report robustness checks. Our findings suggest that credible assessments of wealth tax progressivity require confronting the under-reporting of financial wealth in household surveys.

*Scuola Normale Superiore, Faculty of Political and Social Sciences (Florence)
†Luxembourg Income Study (LIS) and Gdansk University of Technology

1 Introduction

In decades marked by increasing wealth-to-income ratios and disparities (Piketty and Zucman, 2014), the design of wealth taxes is a pertinent topic in economic discourse (Saez and Zucman, 2022). While only a few countries implement comprehensive wealth taxes, others primarily rely on property taxes and inheritance (or transfer) taxes to transmit wealth across generations. Existing wealth taxes, despite their generally progressive nature, exhibit limited redistributive impact due to their small scale (Kuypers et al., 2020). Given the underperformance of current legislation, there is a growing need to develop effective wealth taxation strategies to significantly address wealth inequality. However, assessing the role and efficacy of wealth taxes, even for policy design, hinges on the availability of reliable data. In other words, understanding the scope for effective wealth tax design depends on credible measurement of the wealth distribution.

A central measurement challenge is that household surveys tend to miss wealth at the top of the distribution. Financial assets play an important role in wealth portfolios (Epstein, 2005; Godechot, 2016), are highly concentrated among affluent households, and are precisely where survey totals tend to fall below national accounts aggregates. In the literature on wealth and income distribution, sampling errors, particularly those related to missing data, are widely discussed. Various methodologies, such as replacement (Vermeulen, 2018) and re-weighting (Munoz and Morelli, 2021), address unit non-response issues, especially among the affluent. Complementing these survey-based corrections, recent efforts linked to the World Inequality Database (WID) integrate data from tax sources, household surveys, and national accounts to produce Distributional National Accounts (DINA) that allocate national income to households.

To quantify how missing financial wealth biases wealth inequality and the estimated redistributive impact of wealth taxation, we propose a correction strategy that differs in scope and method from existing approaches. Methodologically, rather than constructing a full DINA series, we target the largest micro-macro wedge, financial assets, and repair survey values *non-proportionally* via calibrated cross-country statistical matching that leverages Norway's administrative registers as a donor. This preserves survey micro-structure while moving aggregates toward national accounts and lets us trace how measurement corrections change inequality and wealth tax progressivity. Unlike the ECB's Distributional Wealth Accounts (DWA), which implement a top correction and allocate the *proportional* remainder to exhaust NA totals (EG-DFA, 2024), we do not force full balance sheet macro closure, and we deliberately do not (yet) adjust asset ownership. Using the Luxembourg Wealth Study (LWS) Database, we apply the procedure to Austria, Canada, and Italy and provide evidence on how missing financial wealth affects wealth inequality. We also contribute to the wealth policy debate by evaluating the redistributive effects of stylized

wealth tax schedules using the Reynolds-Smolensky (RS) index.

The paper is organized as follows. Section 2 reviews wealth data adjustment strategies and positions. Section 3 discusses micro-macro wealth data discrepancies, including data sources, coverage, and comparability issues, as well as business equity mapping. Section 4 compares LWS aggregates with national accounts. Section 5 details our methodology. Section 6 presents results on corrected survey/NA ratios, inequality, and taxes, with robustness in Section 7. The last Section concludes with implications for wealth microdata users and policy makers.

2 Background on wealth data

There are several explanations for the gap between micro and macro data on wealth. Assuming proper survey sampling that accurately captures all subgroups of the population, the two main issues contributing to this gap stem from non-response and misreporting. The former refers to the tendency not to respond to survey questionnaires at all (unit non-response) or to specific wealth questions (item non-response); the latter refers to reported values of wealth sub-components that differ from true values, including under-reporting. Both issues are most prevalent at the top of the wealth distribution and are often discussed in the literature under the heading of missing top wealth and under-reporting. Most strategies to correct wealth survey data aim to address one or both issues.

As discussed by Kennickell et al. (2022), the bridge between micro and macro data is constructed using three different data adjustment strategies. First, one must decide whether to allocate missing wealth proportionally (which preserves relative positions) or non-proportionally (which allows it to be concentrated among specific groups, typically at the top). Second, researchers may adjust not only reported amounts but also asset ownership since part of the gap may reflect unreported ownership. This strategy involves estimating the probability of holding an asset using the hurdle model. Finally, one must decide how to treat the missing wealth at the top of the distribution, for instance, by correcting the top, replacing observations, or reweighting survey weights. Kennickell et al. (2022) compares the results of different adjustment methodologies using Austrian HFCS data (16 models based on the combinations of the modeling choices outlined above), and demonstrates that allowing for the use of non-proportional (multivariate) rather than proportional allocation is the technical choice that drives up wealth inequality more than others. These choices provide a clear framework for situating approaches that reconcile survey microdata with macro aggregates and for understanding why results can diverge across studies.

A complementary strand is the Distributional National Accounts (DINA) program, which reconciles surveys, tax/administrative sources, and national accounts to produce macro-

consistent distributions for the full population. In Europe, Waltl (2022) extends this to a multidimensional DINA for wealth, documenting large survey shortfalls, especially for financial assets, relative to national accounts. Country applications such as Bach et al. (2020) likewise merge surveys, tax records, and national accounts to 'close the macro gap'. Carranza et al. (2023) apply the WID-adjustment to examine variations in inequality across countries using EU-SILC data. Flachaire et al. (2023) offers a particularly interesting contribution by comparing survey and administrative income outcomes to precisely capture under-reporting, finding that it increases with income level.

A recent comprehensive attempt to correct survey wealth data using information from national accounts is the Distributional Wealth Accounts from the ECB (EG-DFA, 2024). This methodology, applied to Eurozone countries and used to correct HFCS survey data, involves several steps, outlined in the methodological note. In short, the authors implement a correction for missing wealth at the top, and split the remaining missing wealth proportionally across the households. However, they do not correct for ownership of wealth assets.

3 Micro-macro wealth data discrepancies

In this section, we compare micro and macro wealth data. As a microdata source, we use the Luxembourg Wealth Study (LWS) database, which provides harmonized wealth microdata for 19 countries, observed between 1995 and 2023, and constitutes the most comprehensive database on wealth worldwide. As a macro data source, we use OECD National Accounts (NA) data. The key idea is that we can estimate the extent of the missing part of the wealth distribution by comparing LWS weighted totals with corresponding NA totals. Such a micro-macro comparison is standard in the literature. For instance, the ECB paper by Ahnert et al. (2020) discusses the discrepancies between NA and the Household Finance and Consumption Survey (HFCS), while Jantti et al. (2008) documents early evidence using initial LWS waves. The authors agree on the complexity of these micro-macro comparisons due to conceptual differences between micro (surveys) and macro (NA) data, including the definition of the household sector, reference periods, valuations methods of assets, debt, and incomes (self-evaluation in surveys versus accounting/market valuation in national accounts).

3.1 Countries and comparability

Given these challenges and the assumptions explained below, we analyze LWS-NA comparability across eleven countries, selected based on the degree of comparability and availability of official data sources: Austria, Australia, Canada, Denmark, Finland, Germany, Italy, Norway, Spain, the United Kingdom, and the United States. The selected countries differ

in terms of LWS data sources. For complete coverage of the dataset description, refer to Appendix A and the LIS website.

Norway and Denmark are the only countries with census-like register data (they provide LWS with a 10% extraction from administrative registers). Finland combines survey and register information, whereas the remaining countries rely solely on surveys. Other crucial differences in these countries' wealth data include the unit of collection (household- or individual-level collected wealth) and the potential oversampling at the top to counter non-response. Among these eleven countries, wealth is recorded at the individual level only in the United Kingdom and Norway; elsewhere, the more standard household-level collection is used. Oversampling at the top was implemented in Australia, Canada, Finland, the United Kingdom, and the United States.[1]

3.2 National accounts sources and coverage

Regarding the national accounts, we use OECD Financial and Non-Financial Accounts, focusing on the household sector. In implementing the comparison, we modulated the definitions of wealth components adopted in LWS and NA to make them as coherent as possible, while acknowledging remaining cross-country differences.

We use the OECD data for the national accounts totals of financial assets, because it is the most comparable and coherent data source worldwide. An exception is the United States, for which we use data from the Federal Reserve Bank of St. Louis.

In the OECD classification, household financial assets are divided into eight categories, including: AF.1 - Monetary gold and SDRs; AF.2 - Currency and deposits; AF.3 - Debt securities; AF.4 - Loans; AF.5 - Equity and investment fund shares/units; AF.6 - Insurance pension and standardised guarantees; AF.7 - Financial derivatives and employee stock options.[2]

A similar breakdown exists for liabilities, although the values for LF.1, LF.2, LF.4, and LF.6 (corresponding to the asset categories AF.1, AF.2, AF.4, and AF.6) are always equal to zero. In the OECD classification of non-financial assets, we focus on the household sector plus non-profit institutions serving households (NPISH). The presence of NPISH may drive the real estate wealth totals upward, implying that the survey-NA ratios for

[1] In the United States, a few observations had net wealth at least equal to the minimum level needed to qualify for the Forbes list, thus they were removed from the public dataset.

[2] The sub-categories are the following: AF.11 Monetary gold; AF.12 Special drawing rights (SDRs); AF.21 Currency; AF.22 Transferable deposits; AF.29 Other deposits; AF.31 Short-term debt securities; AF.32 Long-term debt securities; AF.41 Short-term loans; AF.42 Long-term loans; AF.51 Equity; AF.511 Listed shares; AF.512 Unlisted shares; AF.519 Other equity; AF.52 Investment fund shares/units; AF.521 Money market fund shares/units; AF.522 Non-Money market fund shares/units; AF.71 Financial derivatives; AF.72 Employee stock options; AF.81 Trade credits and advances; AF.89 Other accounts receivable, excluding trade credits and advances.

non-financial assets we display are a lower bound.

Since we want to focus on real estate wealth, the components of non-financial assets which we consider in the analysis are the following: i) Dwellings; ii) Land; iii) Other buildings and structures (composed of buildings other than dwellings and other structures). On the survey side, we utilize LWS harmonized variables for financial assets (HAF), real estate wealth (HANR), and liabilities (HL). Table 1 shows the two data sources and the variables used for micro-macro comparisons.

Table 1: National Accounts (NA) and survey (LWS) data correspondence

Wealth variable	Data source	
	NA	LWS
Currency and deposits	AF.2	HAFC
Financial investments	AF.3+AF.4+AF.5+AF.7	HAFI
Other financial accounts	AF.8	HAFO
Financial liabilities	LF.3+LF.4+LF.7+LF.8	HL
Real estate	Dwellings+Land+Other buildings and structures	HANR

We focus on financial assets and real estate wealth as primary reference aggregates. The former is defined as the sum of four main components: i) deposits and currency; ii) financial investments (composed of bonds and other debt securities, as well as stocks and other equities, plus investment funds and alternative investments); iii) other non-pension financial assets (residual). To mitigate the bias between surveys and NA, we exclude pension entitlements and reserve guarantees from the definition of financial assets. However, we acknowledge that the share of this important component in total financial assets may vary significantly across countries. Real estate assets are constituted by the value of all the real estate owned, both residential and non-residential, including the value of built-up land.

3.3 Business equity: mapping challenges

The key issue related to the micro-macro comparison concerns the classification of business wealth (business equity), in particular, where it is recorded in the balance sheet. National accounts do not report an exact counterpart to survey-measured privately held business equity as a separate line item. As discussed by Ahnert et al. (2020), business wealth may be recorded under the unlisted shares (AF.512) and other equity (AF.519) when the business is treated as a corporation or quasi-corporation. Alternatively, it may be considered as part of other financial and non-financial assets when the business is not distinguishable from the household.

In LWS, business equity is measured as the net current market value of unincorporated, privately held, owner-managed businesses attributable to the household. In survey questionnaires, this concept refers to the amount the household would receive for its share if the business were sold today after settling all business debts. Because the value of unincorporated business may include cash holdings, inventories, livestock, machinery, and other components, business equity, as usually reported in household wealth surveys, can overlap with both financial and non-financial assets. Publicly traded businesses, the unlisted shares and other equity are recorded separately and excluded from the business equity measure.

Given these conceptual discrepancies, business equity cannot be precisely mapped between micro and macro data sources. In the following section, we therefore propose alternative constructions to assess how sensitive LWS-NA ratios of financial assets are to the treatment of business equity.

4 Survey-to-national accounts ratios

The next step, given the data restrictions and mapping choices discussed in the previous section, is to compare survey (LWS) weighted totals with corresponding national accounts (NA) totals.

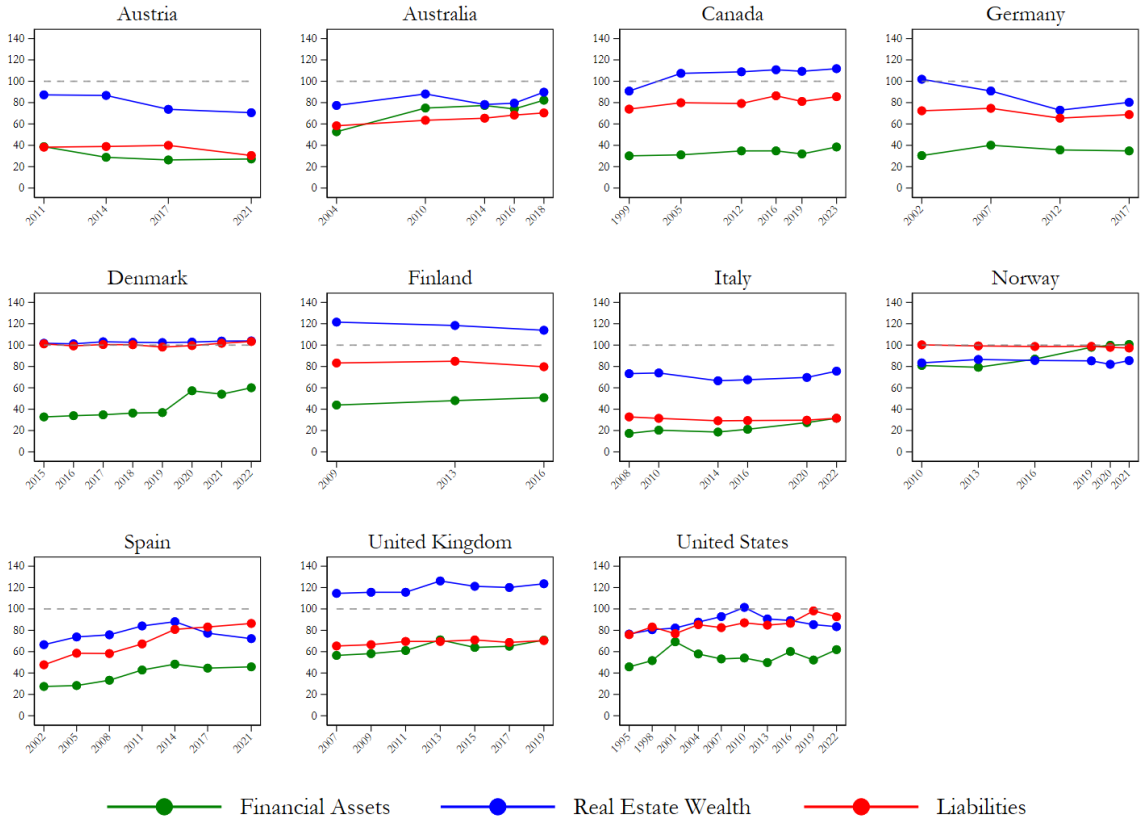
In Figure 1, we present ratios of LWS weighted totals to national accounts totals for financial assets, financial liabilities, and real estate wealth across 11 countries and all available LWS waves. The values used for elaborating these figures are explained in the previous Section (Table 1). A ratio equal to or close to 1 (or 100 in percentage points) corresponds to a high degree of precision in survey data collection: the total from the survey data is close to or equal to the total from the national accounts. A ratio lower than one corresponds to imprecise survey values, which can be due to many error sources, such as survey non-response, under-reporting, but also conceptual differences between surveys and NA.

The primary evidence from Figure 1 is that financial assets (green lines) have extremely low survey-to-NA ratios, especially in some countries, compared with other wealth components, such as liabilities (red lines) and real estate (blue lines). Jantti et al. (2008) has already discussed this issue. Still, these figures provide an update to the most recent wealth values available in LWS. The overall picture appears clear: apart from Norway, which consistently shows ratios around 100 for all three wealth components (due to the register data), there are significant discrepancies in the other countries. The overall picture appears clear: apart from Norway, which consistently shows ratios around 100 for all three wealth components (due to the register data), there are significant discrepancies in the other countries. Denmark shows a similar pattern to Norway for real estate and liabilities, with

both ratios close to 100 throughout the period, consistent with register-based collection. Financial assets ratios are markedly lower, however, starting around 32–35 in 2015–2019 and rising to around 57–60 from 2020 onward — an increase that coincides with the introduction of unlisted shares as a separately captured component, absent from the earlier waves.[3] In most countries, there is a clear ranking, with real estate ratios that are higher than liabilities ratios, which in turn exceed financial assets' ratios. Countries such as Australia, the United Kingdom, and the United States display financial asset ratios of around 60%, well below the NA aggregates but still notably higher than in other survey-based countries. Overall, given that oversampling already seeks to address potential non-response at the top, this may mean the under-reporting issue is less relevant in these countries. Moreover, an additional and potentially important role may be played by the different survey design of the British survey, since the data are collected at the individual rather than household level. In Finland, given the structure of its LWS data, which are survey-based but incorporate register information, we see an intermediate situation, with financial assets ratios around 50% in the last wave (2016). In Austria, Canada, Germany, Italy, and Spain, the financial assets' ratios are particularly low (below 50% across the waves) and much lower than real estate ratios.

[3]We thank Statistics Denmark for clarifying, through personal correspondence, that two items — a company-scheme deposit allowing self-employed individuals to defer tax on saved profits, and the calculated market value of co-operative housing — are recorded as financial assets (F.5) in the Danish national accounts. To ensure consistency between our micro and macro aggregates, we follow this classification and treat both variables as financial assets in the LWS data, rather than applying the LWS default classification. Without this adjustment, the Danish financial assets ratio would be substantially lower.

Figure 1: Comparison between LWS weighted totals and National Accounts totals, ratios of financial and real estate wealth



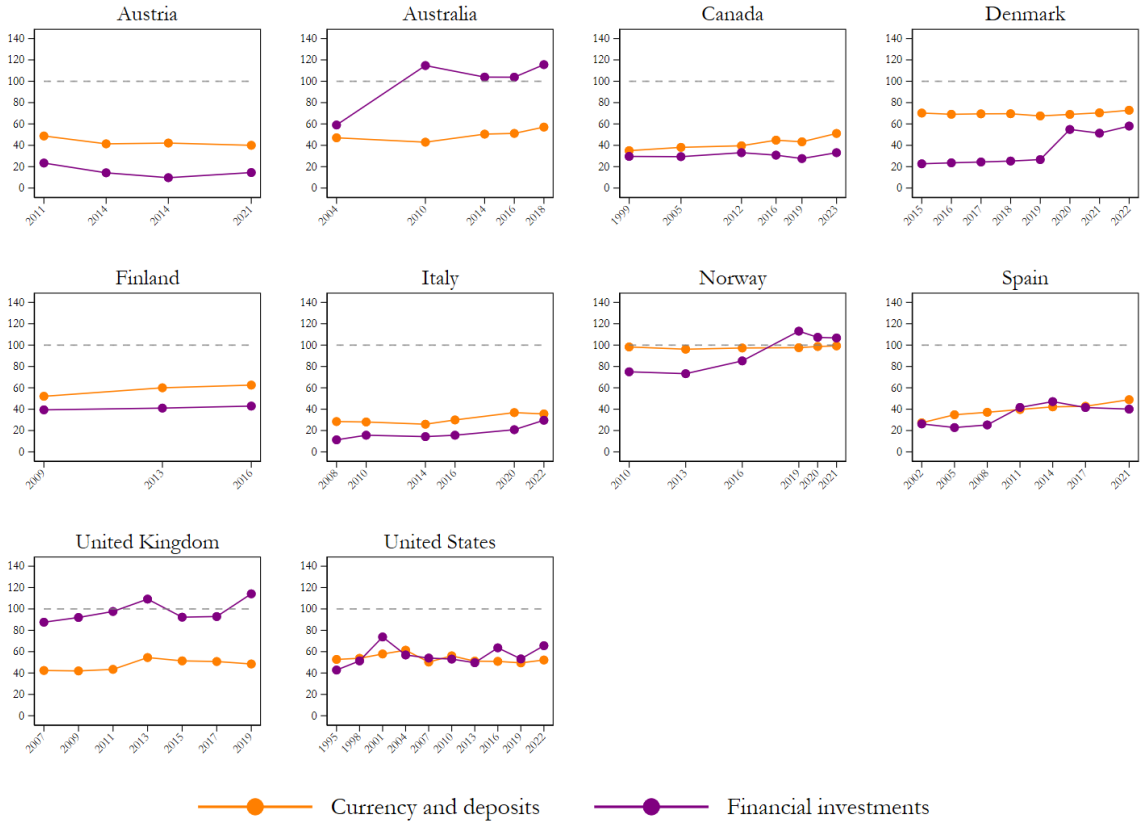
Notes: The Figure shows ratios of survey weighted totals on national accounts totals for financial assets (green line), real estate wealth (blue line) and liabilities (red line). Ratios are expressed in percentage points. Horizontal dashed lines represent a ratio value of 100, indicating equality between LWS and NA totals. **Source**: Authors' elaborations based on LWS data and National Accounts (OECD).

In Figure 2, we further explore the comparison of micro-macro financial wealth data by proposing ratios for sub-components of financial assets. As explained previously, financial assets can be split into three main sub-components: currency and deposits, financial investments, and other financial accounts (residual). In Figure 2, we focus on the first two, the currency and deposits ratio (denoted by the orange line) and the financial investments ratio (denoted by the purple line).[4]

The gap between survey and national accounts is more pronounced for financial investments than for currency and deposits in Austria, Canada, Denmark, Finland, and Italy. The trends are opposite for Australia and the United Kingdom, while the ratios are similar in Norway, Spain, and the United States. This evidence suggests that the micro-macro gap is not distribution-neutral, as ownership of financial investments tends to coincide with more affluent households, in line with findings on incomes by Flachaire et al. (2023).

[4]The composition of financial assets is not available for Germany.

Figure 2: Comparison between LWS weighted totals and National Accounts totals, components of financial assets' ratios



Notes: The Figure shows ratios of survey weighted totals on national accounts totals for financial assets sub-components: currency and deposits (orange line) and financial investments (purple line). Ratios are expresses in percentage points. Horizontal dashed lines represent a ratio value of 100, indicating equality between LWS and NA totals. **Source**: Authors' elaborations based on LWS data and National Accounts (OECD).

Finally, we incorporate the role of business equity into this descriptive analysis. As discussed in the previous Section, there is a discrepancy between the conceptual definition of business equity in surveys and that in national accounts. In Figure 1, the low financial assets ratio may also be due to the fact that the denominator (the total of NA financial assets) is inflated by the business equity component. To account for this possible error, we apply two alternative corrections to the ratios. First, we decrease the denominator by the amount of unlisted shares and other equity recorded in the financial accounts, as this is a component most directly linked to business equity. These results are denoted with the black line in Figure 3. The second correction consists of increasing the ratio numerator (LWS weighted totals) by the amount of the business equity observed in the survey. These results are denoted with the yellow line in the Figure.

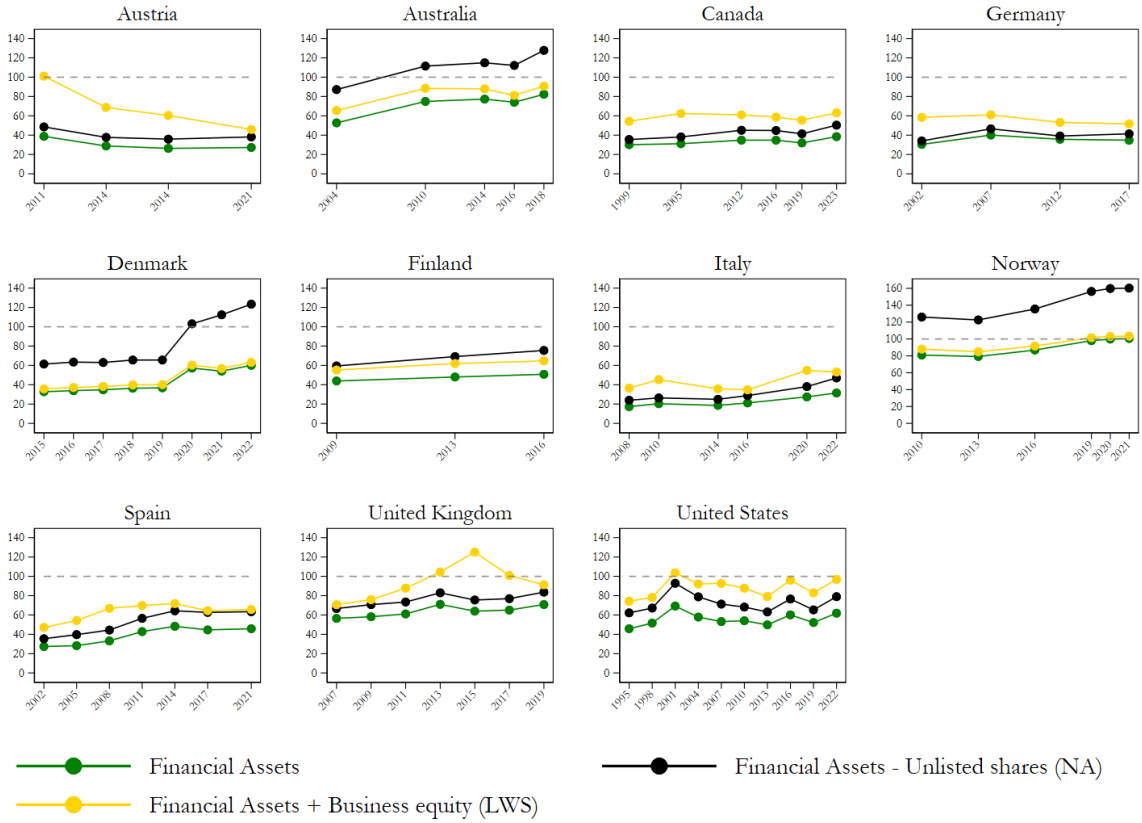
The rationale for these modified ratios is that, given the ambiguous role of business equity in the micro-macro data comparison, we assume that the entire business equity reported

in the surveys is treated as non-listed shares, even though it is part of financial assets. This configuration is opposed to that adopted for Figure 1, depicting two extreme cases that may be considered as upper and lower bounds. The 'true' survey of financial assets lies between these two extremes.

Figure 3 displays the modified ratios. Both proposed correction methods, as expected, increase the LWS/NA ratios. Still, there are significant differences between the alternative corrections and across countries. In particular, in most countries, adding business equity to the numerator (LWS) results in substantial increases in the ratios, exceeding those obtained when cutting unlisted shares from the denominator (NA). Australia, Denmark, Finland, the United Kingdom, and Norway constitute exceptions. These countries are a mix of over-sampling and register countries. The case of Norway is particularly interesting, as the ratio excluding unlisted shares exceeded 160 percent in 2021. This evidence is also expected since, as we display in Figure 1, Norway uses register data that perfectly map to the national accounts totals; indeed, this addition is not needed for this country but helps to clarify the extent to which Norwegian data are different from the other LWS countries. Still, in countries such as Austria, Canada, Germany, Italy, and Spain, even accounting for the entire business equity as part of the financial accounts does not fill the gap between survey and NA financial assets' totals.

This Section provided a descriptive discussion on the issues of missing wealth in LWS. The main takeaways are that financial assets are under-reported more than non-financial (real estate) assets; business equity has a somewhat different weight in the considered economies, and liquid assets (currency and deposits) are under-reported less than financial investments.

Figure 3: Comparison between LWS weighted totals and National Accounts totals, ratios including business equity



Notes: The Figure shows ratios of survey weighted totals on national accounts totals for financial assets (green line). Ratios are expresses in percentage points. Horizontal dashed lines represent a ratio value of 100, indicating equality between LWS and NA totals. **Source**: Authors' elaborations based on LWS data and National Accounts (OECD).

5 Financial wealth correction methodology

In this paper, we make several choices to apply a correction methodology to wealth data, distinguishing us from previous work. First, we focus exclusively on financial assets, since, as shown and discussed in the previous section, there is a clear tendency for these wealth assets to be lower than their national account counterparts. In particular, we focus on Austria, Canada, and Italy, which are the countries that, according to Figure 1, show the lowest survey/NA ratios (below 40% across all waves), and for which we have complete information.[5] The micro-macro discrepancies in these countries have been the subject of multiple studies in recent years: respectively Bonci et al. (2005); D'Alessio and Neri (2015) for Italy, Andreasch and Lindner (2016); Kennickell et al. (2022) for Austria, and Antoniewicz et al. (2005) for Canada. These studies help understand the relevance of

[5]Germany is excluded since the financial assets' composition is missing in LWS.

wealth under-reporting in these countries.

We focus on the last available waves, namely 2021 for Austria, 2022 for Italy and 2023 for Canada, while in Appendix D we propose additional results with previous LWS waves.

The second modeling choice is not to account for asset ownership, and therefore not to apply a hurdle model. This choice is not neutral with respect to inequality, since an increase in the proportion of asset owners is, by definition, an inequality-reducing adjustment. Still, we aim to isolate changes in the distribution of asset values without altering the underlying support. The last element of our methodology is the application of a non-proportional correction. Our aim is not merely to undertake a statistical procedure with the sole intention of matching the national account totals, but rather to apply economic principles to the financial wealth correction, which leads to inequality-altering adjustments.

For the selected countries, we can sketch the following data correction problem. The starting household financial wealth distribution is x_i, with a weighted total equal to $x_{tot}^{LWS} = \sum w_i x_i$, where w_i correspond to household survey weights. We know from previous sections that survey based estimates values of financial wealth are lower than those from national accounts. The 'true' financial assets' total is x_{tot}^{NA}, with $x_{tot}^{NA} > x_{tot}^{LWS}$. In the context of LWS data, we have other financial assets' data, y_i, that can be used to impute values. In this case, the weighted total equals y_{tot}^{LWS} , and this value is not under-reported; we have that $y_{tot}^{LWS} = y_{tot}^{NA}$. The two financial assets' distributions, x_i and y_i, share some common household characteristics, Z_i, such as age, gender, education, income, and net wealth.

Indeed, the challenge here is to find a statistical procedure to impute data, while keeping the new overall weighted total equal to the 'true' one from national accounts. Based on the statistical and economic literature, we believe the best approach to implement and incorporate our correction modeling choices is to apply a calibrated statistical matching.

We, first, obtain an imputed financial assets' distribution from statistical matching based on the common support Z_i, which we define as x_i^*.[6] Then, we proceed to calibrate these values to match the 'true' total of financial assets as follows:

$$x_i^* = \tilde{x}_i . \frac{X_{tot}^{NA}}{\sum w_i \tilde{x}_i}$$

In our specific application, we adopt LWS data since their cross-country harmonization enables easy mapping of information across countries. The correction of financial asset amounts is applied through calibrated statistical matching using the Norwegian database as the data donor and datasets from Austria, Canada, and Italy as the data recipients.

[6]We follow the statistical matching procedure explained by D'Orazio et al. (2006). Statistical matching is implemented using the R package *StatMatch*.

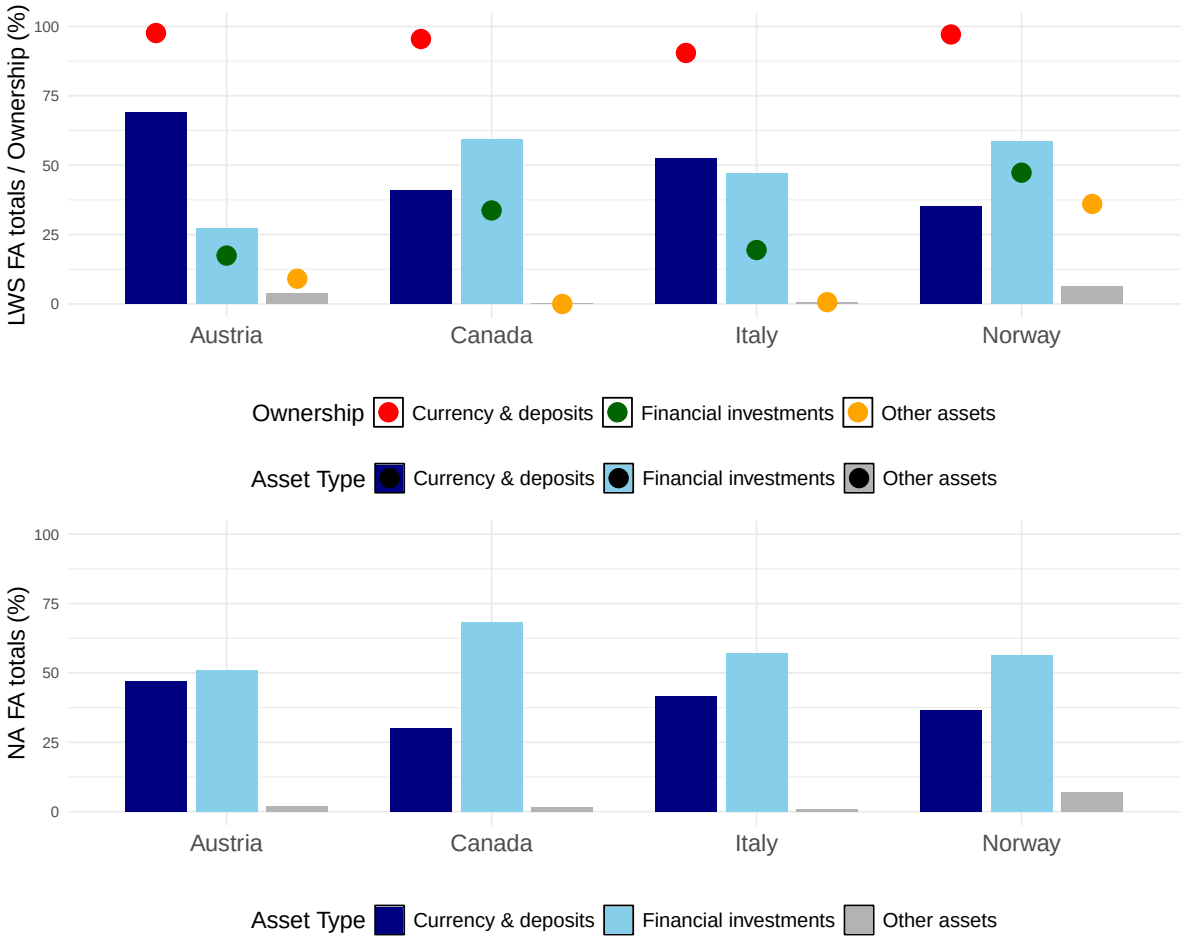
The Norwegian data source for financial assets is the most reliable among the analyzed LWS countries, given its unique nature (register data) as well as its survey/NA ratios of around 100 (as seen in the previous Section). The cross-country comparability of financial assets amounts is ensured by using purchasing power parities from the LIS database (expressed in 2021 dollars). As for the matching unit, the reference is the household. The link function relies on a set of common characteristics collected in the harmonized LWS surveys. In particular, they include the household head's age, education level, and gender, the disposable household income (quintiles), and the household net wealth (deciles). In Appendix B, we provide information on the comparison of demographic characteristics in the donor and recipient countries.

To control for systematic differences between the donor and recipient samples and obtain a more accurate matching, we divide the dataset into cells based on financial wealth percentiles. We repeat the procedure across different percentile specifications, ranging from 5 to 25 percentile groups. We, then, proceed to match units that are included in the same cell only. Once the matching is implemented, we replace the 'corrected' asset values with the 'original' asset values, keeping the maximum value between the two.

A more general point regards the different investment portfolio choices across the four analysed countries. In Figure 4, we compare the financial assets composition in the donor and recipient countries using both survey (top panel) and national accounts (bottom panel) figures. The survey shares of deposits and cash, financial investments, and the residual component are mostly similar in Norway and Canada, where financial investments constitute the largest part of financial assets and have also similar ownership rates. Austria stands out compared to other countries, where most financial assets are held in deposits and currency, and where ownership rates for financial investments are low. Italy displays shares of currency, deposits, and financial investments similar to those in Canada and Norway, but with lower ownership rates for financial investments. Still, if we move to the lowest panel in Figure 4, the national accounts components' shares are mostly similar across countries, with only Austria showing slightly lower shares for financial investments.

We acknowledge the potential complications involved in transferring financial asset values from one country to another, each with its own social, economic, and financial specificities. Nevertheless, our approach does not entail imposing one country's entire financial investment structure onto another. Our procedure, therefore, consists of a targeted replacement implemented within strict boundaries defined by households' economic and financial characteristics and calibrated to keep the total of financial assets equal to the national accounts' figures.

Figure 4: Country comparisons: financial assets' composition in survey data



Notes: The Figure shows the shares of total financial assets divided into three sub-components: i) currency and deposits; ii) financial investments; iii) other assets, in Austria, Canada, Italy (recipient countries), and Norway (donor country). **Source**: Authors' elaborations based on LWS data. LWS waves: Norway (2021), Austria (2021), Italy (2022), Canada (2023).

6 Results

In this Section, we present the main results of the paper, including inequality indices before and after the financial data adjustment, as well as an analysis of the redistribution arising from a financial wealth tax in Austria, Canada, and Italy. To ensure the robustness of our results, each inequality and redistribution effect estimate reported in the following tables is calculated as the average across multiple iterations generated by the statistical matching procedure using between 5 and 25 financial-wealth percentile cells (see the previous section for details on the matching methodology).

In Appendix C, we present the details of the kernel densities before and after the financial assets adjustment in Austria, Canada, and Italy.[7] As expected, the correction

[7]Given the multiple matching iterations, we report the kernel densities associated with the Gini

implementation implies a right shift of the wealth distribution.

6.1 Inequality measures

In Table 2, we present evidence on the levels of inequality in the distribution of financial assets before and after the 'missing wealth' imputation. Wealth inequality is measured using two indices: the Gini index and the top 10% wealth share. This allows us to assess whether the corrected financial assets, whose totals align with those in the national accounts, are associated with a more equal or an unequal distribution.

If we look at the original data, inequality is lowest in Austria, with a Gini coefficient of 0.689, considerably below the level observed for financial assets in Norway (0.819). The values are higher in Italy (0.784) and Canada (0.833), and the top 10% wealth shares follow the same country ranking. Applying the correction methodology described in the previous section leads to a substantial increase in measured inequality across all three countries. As expected, given its lower initial level, Austria shows the strongest effect: its Gini index rises by about 32%, compared with increases of 8.9% in Canada and 9.1% in Italy. The adjustment is even more pronounced for the top 10% wealth share, indicating that most of the previously missing wealth is concentrated at the top of the financial asset distribution. In Austria, this share increases by around 59%, while in Canada and Italy it rises by about 17%.

What would have changed in terms of financial asset inequality if we had applied proportional allocation instead of the non-proportional allocation discussed above? In fact, nothing would have changed, since both the Gini index and the top 10% wealth share are scale-invariant. Increasing all original values by the same proportional factor leaves inequality measures unaffected.

The key takeaways from these results are as follows: i) the non-proportional correction methodology increases measured inequality; ii) there is a marked cross-country difference in the impact of the correction, with Italy and Canada being less affected than Austria; iii) the correction methodology is more effective at the top of the distribution, as the changes in the top 10% wealth share exceed those observed in the Gini index.

coefficient closest to the average Gini value across iterations.

Table 2: Wealth totals ratios and inequality with original and corrected financial assets

Asset type	Wealth data	Measure	Austria	Canada	Italy
Financial assets	original	Gini index	0.689	0.833	0.784
Financial assets	original	Top 10% share	0.552	0.741	0.673
Financial assets	corrected	Gini index	0.912	0.908	0.856
Financial assets	corrected	Top 10% share	0.876	0.865	0.787
Corrected/original diff. (+%)		Gini index	32.4	8.9	9.1
Corrected/original diff. (+%)		Top 10% share	58.7	16.7	16.9

Notes: The Table shows financial assets' inequality, measured with Gini Index and top 10% wealth share, before and after applying the data correction methodology explained in Section 5 in Austria, Canada and Italy. Figures correspond to averages across multiple statistical matching iterations. **Source**: authors' elaborations on LWS waves: Norway (2021), Austria (2021), Italy (2022), Canada (2023).

6.2 Financial wealth tax redistribution

Finally, we undertake a simplified simulation exercise to evaluate the extent of the distributional effect of a wealth tax. We propose two alternative wealth tax designs. The first is a 'flat' tax, in which households with net wealth of more than 1 million dollars pay a 5% tax rate on their net wealth. The second is a 'progressive' tax, in which households owning more than 1 million dollars pay a tax rate that ranges from 5 to 12%, moving from 1 million up to 20 million of net wealth.[8] We, then, evaluate the redistributive effect of each tax design using the Reynolds-Smolensky index (RS). [9] A positive index value indicates that the tax system reduces financial assets' inequality, a negative value suggests it increases it, and a value of zero means there is no change in inequality.

In Table 3, we present the results of this tax simulation, examining both the redistributive effect of the tax on the Gini index and the top 10% wealth share.

Applying the correction for financial assets results in a general increase in the redistributive effect, as captured by the rise in the RS index following the data adjustment. Focusing on the flat tax results (Panel A), the RS index based on the Gini index increases by threefold in Austria, by 1.6 times in Canada, and by 2.1 times in Italy. Similar values hold for the top 10% wealth share.

[8] In detail: 5% tax rate on financial assets exceeding 1 million, 7% for values exceeding 5 millions, 10% for values exceeding 10 millions and 12% for values exceeding 20 millions. We convert country currencies into dollars using purchasing power parities from the OECD.

[9] The Reynolds and Smolensky (1977) index measures redistribution as the difference between the Gini coefficients of the pre- and post-tax wealth distributions.

When moving to Panel B, which focuses on the progressive financial wealth taxation, the findings are even more striking. The RS index for the Gini index rises by 5 times in Austria, 2.7 times in Canada, and 3.1 times in Italy, showing a much stronger redistributive effect of the financial wealth progressive tax, depending on the underlying wealth distribution. The figures are confirmed for the top 10% wealth share RS (rises of 5.1 times in Austria, 2.6 times in Canada, and 3.1 times in Italy).

Overall, the main takeaway from this second set of results is the recognition that any assessment of the redistributive effects of a wealth tax must consider the potential under-reporting of wealth, since as we show here, the redistributive effect of a wealth tax may change substantially depending on the underlying wealth distribution. In our example, Austria is the country where this effect is most pronounced.

Table 3: Redistributive effect of financial wealth taxes

		Austria	Canada	Italy
Panel A: Flat taxation				
RS, Gini,	original	0.093	0.186	0.186
RS, Top 10% share	original	0.134	0.299	0.284
RS, Gini index	corrected	0.276	0.333	0.413
RS, Top 10% share	corrected	0.417	0.502	0.614
Corrected/original ratio	Gini index	3.0	1.6	2.1
Corrected/original ratio	Top 10% share	3.1	1.5	2.1
Panel B: Progressive taxation				
RS, Gini index	original	0.099	0.210	0.241
RS, Top 10% share	original	0.143	0.335	0.367
RS, Gini index	corrected	0.495	0.634	0.867
RS, Top 10% share	corrected	0.736	0.944	1.284
Corrected/original ratio	Gini index	5.0	2.7	3.1
Corrected/original ratio	Top 10% share	5.1	2.6	3.1

Notes: The Table shows the Reynolds-Smolensky index (RS) for Gini index and the top 10% wealth share with different wealth tax rates in Austria, Canada, and Italy before and after applying the data correction methodology explained in Section 5. Figures correspond to averages across multiple statistical matching iterations. The Reynolds-Smolensky Index is expressed in units. **Source**: authors' elaborations on LWS waves: Norway (2021), Austria (2021), Italy (2022), Canada (2023).

7 Robustness checks

In this robustness check, we present results on financial wealth inequality and post-tax redistribution, using a financial asset distribution that includes business equity, along with to the original survey data. The aim is to assess how sensitive our results are to potential discrepancies in the definition of business wealth between micro and macro data sources, as discussed at the end of Section 4. Technically, we adjust the recipient distribution of financial assets in the correction methodology, specifically across the financial wealth percentiles (from 2 to 25) used for the statistical matching procedure.

Results are reported in Table 4. Panel A shows the inequality measures, which differ more noticeably from the previous results, especially when comparing the original values, which are substantially higher than the original ones shown in Table 2. Still, there is a gap between the corrected inequality figures, both in terms of Gini and the top 10% share, and the original ones.

In the subsequent panels, we present the results on redistributive effects with the same taxes on financial assets discussed in the previous Section (Panel B for flat and Panel C for progressive taxation). It is interesting to note that there is an overall tendency to decrease the rising trend in the redistributive effect after the addition of business equity. For both the Gini index and the top 10% , we have the RS corrected/original ratios, which are much lower than those shown in the previous section. This result is intuitive because once business equity is added to the distribution, a larger share of wealth stays above the tax threshold, but if business equity is concentrated in the upper-middle rather than the very top of distribution, a flat rate tax hits those households relatively harder, reducing the overall progressivity of the tax.

This mechanism is visible in Austria, where the Reynolds-Smolensky index for flat taxation falls from 0.289 to 0.219 after applying the correction (a reduction of around 20 percent) suggesting that the redistributive effect of the flat tax is substantially weakened once business equity is included. Interestingly, the opposite pattern emerges under progressive taxation, where the RS index slightly increases after the correction (from 0.360 to 0.404 for the Gini), suggesting that the progressive tax structure is better able to capture the additional taxable wealth introduced by business equity. Austria is a particularly instructive case here, given its atypical financial asset composition documented in Section 5, where deposits dominate and financial investment ownership is low. The addition of business equity appears to concentrate additional taxable wealth in parts of Austrian distribution where the flat tax is least progressive, while the progressive tax schedule, by design, reaches further up the distribution. Rather than undermining our main results, this finding illustrates why the treatment of business equity matters, as its redistributive implications depend on whether business equity is captured at all, and where within the

wealth distribution it is located.

An additional robustness check involves applying the correction methodology to other survey waves in Austria, Canada, and Italy. Appendix D reports the main results on inequality levels and redistributive effects, showing that the findings remain broadly stable over time. The case of Italy is particularly interesting, as the correction effect on inequality and redistribution is reduced in the last two available waves (2022 and 2020) compared to earlier waves. This result is expected, since in the 2020 wave, a new survey weighting system was introduced to reduce the non-sample bias and increase participation in the upper parts of the income distribution (Loschiavo et al., 2024).

Table 4: Inequality and redistributive effects with original and corrected financial assets, business equity added to financial investments

Asset type	Wealth data	Measure	Austria	Canada	Italy
Panel A: Inequality measurement					
Financial assets	original	Gini index	0.794	0.867	0.833
Financial assets	original	Top 10% share	0.709	0.804	0.751
Financial assets	corrected	Gini index	0.934	0.906	0.870
Financial assets	corrected	Top 10% share	0.912	0.871	0.807
Corrected/original diff. (+%)		Gini index	17.6	5.3	6.1
Corrected/original diff. (+%)		Top 10% share	28.6	8.8	10.5
Panel B: Flat taxation					
RS, Gini,	original		0.289	0.235	0.242
RS, Top 10% share	original		0.418	0.383	0.376
RS, Gini index	corrected		0.219	0.282	0.336
RS, Top 10% share	corrected		0.322	0.420	0.518
Corrected/original ratio		Gini index	0.8	1.2	1.4
Corrected/original ratio		Top 10% share	0.8	1.1	1.4
Panel C: Progressive taxation					
RS, Gini index	original		0.360	0.262	0.309
RS, Top 10% share	original		0.517	0.424	0.477
RS, Gini index	corrected		0.404	0.499	0.605
RS, Top 10% share	corrected		0.578	0.723	0.921
Corrected/original ratio		Gini index	1.1	1.8	2.0
Corrected/original ratio		Top 10% share	1.1	1.7	1.9

Notes: The Table shows financial asset inequality and redistributive effects after wealth taxes (flat and progressive) using the Reynolds-Smolensky Index (RS) in Austria, Canada, and Italy, while applying a modified data correction that adds business equity to survey financial assets. Figures correspond to averages across multiple statistical matching iterations. **Source**: authors' elaborations on LWS waves: Norway (2021), Austria (2021), Italy (2022), Canada (2023).

8 Conclusions

In this paper, we analyzed the intertwined issues of missing wealth distribution in micro wealth data, wealth inequality, and wealth redistribution through specific taxes. We focused on financial assets, which are the key drivers of wealth inequality and are expected to become even more relevant over the next few decades.

We provide in the first part of the paper a comparison between microdata (LWS) and macro aggregates from the national accounts, which is helpful to recognize the relevance and size of the 'missing wealth' issue. In all the analyzed LWS countries (except Norway), the under-reporting of financial assets is higher than that of real estate wealth. This discrepancy may only be partially explained by the role of business equity. This initial part of the paper documents that differences in the extent of under-reporting of financial assets are an important source of cross-country variation in measured wealth averages and inequality (Cowell et al., 2018).

Subsequently, we apply a correction procedure to three LWS countries (Austria, Canada, and Italy), imputing financial assets values from Norwegian register data available in LWS using statistical matching. The correction methodology is non-proportional, as we did not split the missing wealth equally across the sample population. Instead, we assign new financial asset values based on the demographic and household characteristics available in LWS for both the donor and recipient countries.

Our paper offers valuable insights to inequality scholars, LWS users, and researchers studying wealth distribution. Applying non-proportional correction rather than a simple proportional scaling, which would leave inequality measures unchanged, produces a substantial increase in measured financial asset inequality, especially at the top 10% of the distribution. These results for non-proportional data adjustment are consistent with those found by Kennickell et al. (2022). Cross-country differences play an important role, as in the main results Austria shows the largest increases in both inequality and redistributive effects while Canada shows the smallest, though this ranking partly shifts in the robustness check once business equity is included.

Additionally, the second message is devoted to policymakers. Beyond measuring wealth inequality, we examine the redistributive effects of wealth taxation under the original and corrected distribution of financial assets. This exercise helps consider the policy-related consequences of the missing wealth. The Reynolds-Smolensky index increased substantially across all three countries and specifications, suggesting that the underlying wealth distribution is a crucial factor in measuring the effects of a wealth tax.

Future research avenues are manifold. These include extending the correction methodology to other countries and refining it, either by correcting for asset ownership (thus increasing

the share of owners) or by introducing a specific adjustment for missing top wealth. This element is expected to further widen inequality and redistributive gaps. In this regard, the results presented here constitute a lower bound. Future work can also explore alternative donors and extend tax simulations to a broader definition of wealth.

The main limitation of the article lies in the potential ambiguity surrounding the business equity, namely, the imperfect mapping of business equity between survey concepts and national accounts. We have nonetheless sought to address this issue as thoroughly as possible with a dedicated robustness check, which shows that adding business equity to the original data increases inequality, yet with a greater redistributive effect for the corrected data.

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Appendix A

Table A.1: LWS data description

Country	Data source	Time span
Austria	Household Finance and Consumption Survey (HFCS)	2011-2021
Australia	Survey of Income and Housing (SIH)	2004-2018
Canada	Survey of Financial Securities (SFS)	1999-2023
Germany	German Socio-Economic Panel (GSOEP)	2002-2017
Denmark	Wealth and other Administrative Registers	2015-2022
Finland	Household Wealth Survey (HWS)	2009-2016
	Household Finance and Consumption Survey (HFCS)	
Italy	Survey of Household Income and Wealth (SHIW)	2008-2022
Norway	Household Wealth Statistics	2010-2021
Spain	Survey of Household Finances (EFF)	2002-2021
United Kingdom	Wealth and Assets Survey (WAS)	2007-2019
United States	Survey of Consumer Finances (SCF)	1995-2022

Appendix B

.

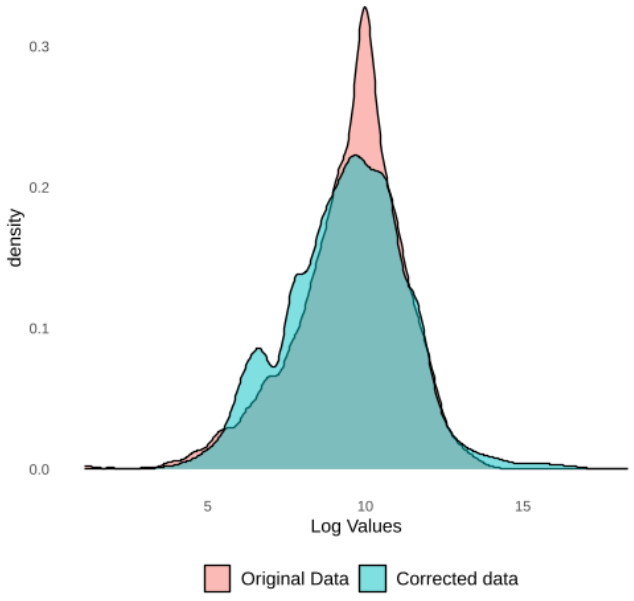
Table B.1: Demographic characteristics used for statistical matching algorithm

	Categories	Countries			
		Austria	Canada	Italy	Norway
Gender	male	45.2	56.7	58.7	68.4
	female	54.8	43.3	42.9	31.6
Educational attainment	high	21.4	69.8	16.8	35.6
	middle	64.2	19.9	40.0	42.0
	low	14.4	10.2	43.3	22.4
Age group	<30	7.7	19.3	2.7	15.7
	30-40	12.0	18.3	10.8	16.7
	40-50	17.9	16.3	17.5	17.1
	50-65	30.6	39.4	31.5	25.5
	>65	31.8	6.7	37.5	25.0

Notes: The Table illustrates how the survey population which holds positive figures of financial assets is divided by gender, education, and age group in Austria, Canada, Italy, and Norway. Each figure is a percentage share; values sum up to 100 by gender, education, and age group. **Source**: Authors' elaborations on LWS waves: Norway (2021), Austria (2021), Italy (2022), Canada (2023).

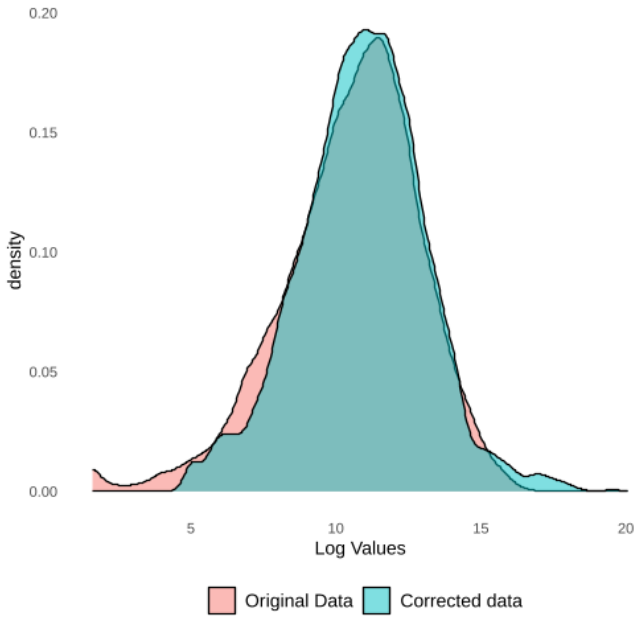
Appendix C

Figure C.1: Log financial assets kernel density comparison, Austria



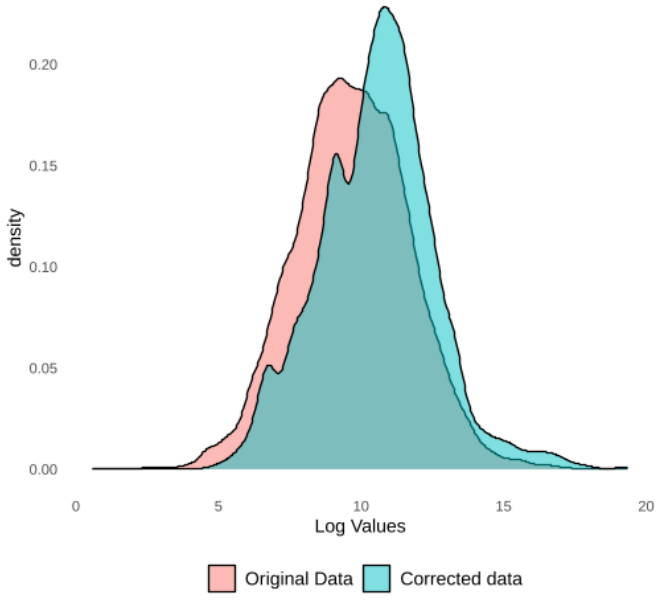
Note: The Figure shows kernel densities in (log) financial assets in Austria, comparing original and corrected data. **Source**: Authors' elaborations based on LWS data.

Figure C.2: Log financial assets kernel density comparison, Canada



Note: The Figure shows kernel densities in (log) financial assets in Canada, comparing original and corrected data. **Source**: Authors' elaborations based on LWS data.

Figure C.3: Log financial assets kernel density comparison, Italy



Note: The Figure shows kernel densities in (log) financial assets in Italy, comparing original and corrected data. **Source**: Authors' elaborations based on LWS data.

Appendix D

Table D.1: Inequality levels with original and corrected financial assets, previous waves

Asset type	Wealth data	Measure	Austria	Canada	Italy
Waves			2017	2019	2020
Financial assets	original	Gini index	0.675	0.833	0.783
Financial assets	original	Top 10% share	0.537	0.739	0.671
Financial assets	corrected	Gini index	0.878	0.913	0.831
Financial assets	corrected	Top 10% share	0.819	0.876	0.751
Corrected/original diff. (+%)		Gini index	30.1	9.6	6.1
Corrected/original diff. (+%)		Top 10% share	52.6	18.5	11.9
Waves			2014	2016	2016
Financial assets	original	Gini index	0.669	0.840	0.754
Financial assets	original	Top 10% share	0.519	0.755	0.640
Financial assets	corrected	Gini index	0.874	0.897	0.887
Financial assets	corrected	Top 10% share	0.813	0.852	0.835
Corrected/original diff. (+%)		Gini index	30.6	6.8	17.6
Corrected/original diff. (+%)		Top 10% share	56.7	12.8	30.5

Notes: The Table shows financial asset inequality before and after applying the data correction methodology described in Section 5 in Austria, Canada, and Italy. Figures correspond to averages across multiple statistical matching iterations. **Source**: authors' elaborations on LWS data.

Table D.2: Redistributive effect of financial wealth taxes, previous waves

		Austria	Canada	Italy
Waves		2017	2019	2020
Panel A: Flat taxation				
RS, Gini,	original	0.062	0.186	0.182
RS, Top 10% share	original	0.089	0.299	0.278
RS, Gini index	corrected	0.356	0.293	0.398
RS, Top 10% share	corrected	0.539	0.439	0.596
Corrected/original ratio	Gini index	5.7	1.6	2.2
Corrected/original ratio	Top 10% share	6.1	1.5	2.1
Panel B: Progressive taxation				
RS, Gini index	original	0.062	0.210	0.248
RS, Top 10% share	original	0.089	0.335	0.378
RS, Gini index	corrected	0.694	0.577	0.776
RS, Top 10% share	corrected	1.044	0.852	1.154
Corrected/original ratio	Gini index	11.2	2.7	3.1
Corrected/original ratio	Top 10% share	11.7	2.5	3.1
Waves		2014	2016	2016
Panel C: Flat taxation				
RS, Gini,	original	0.050	0.169	0.106
RS, Top 10% share	original	0.073	0.268	0.156
RS, Gini index	corrected	0.360	0.318	0.336
RS, Top 10% share	corrected	0.545	0.473	0.504
Corrected/original ratio	Gini index	7.2	1.9	3.2
Corrected/original ratio	Top 10% share	7.5	1.8	3.2
Panel D: Progressive taxation				
RS, Gini index	original	0.050	0.191	0.110
RS, Top 10% share	original	0.073	0.302	0.163
RS, Gini index	corrected	0.679	0.612	0.651
RS, Top 10% share	corrected	1.021	0.900	0.968
Corrected/original ratio	Gini index	13.6	3.2	5.9
Corrected/original ratio	Top 10% share	14.0	3.0	5.9

Notes: The Table shows the Reynolds-Smolensky index (RS) for Gini index and the top 10% wealth share at different wealth tax rates in Austria, Canada, and Italy, before and after applying the data correction methodology described in Section 5. Figures correspond to averages across multiple statistical matching iterations. The Reynolds-Smolensky Index is expressed in units. **Source**: authors' elaborations on LWS data.