BANCA D'ITALIA
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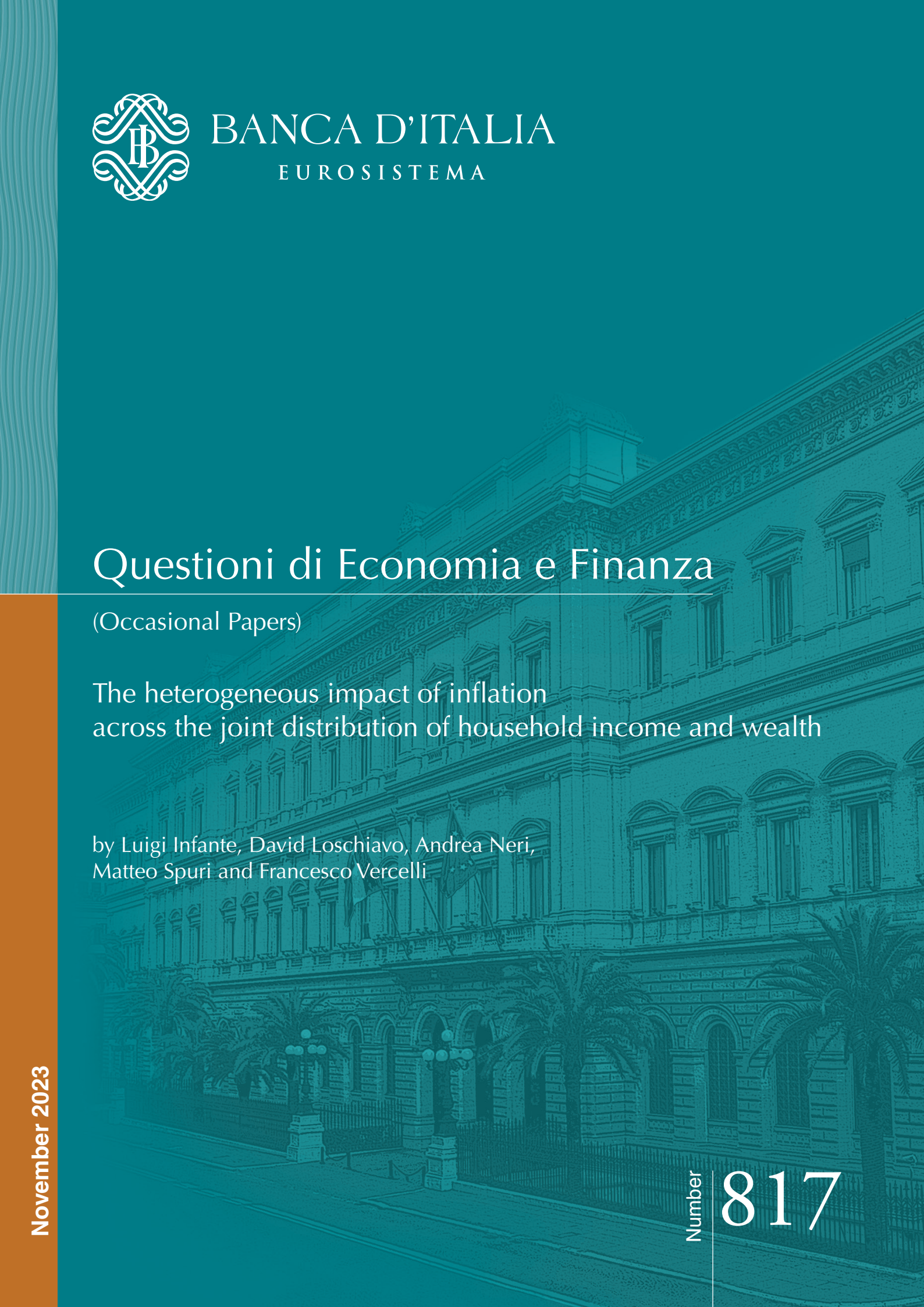

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THE HETEROGENEOUS IMPACT OF INFLATION ACROSS THE JOINT DISTRIBUTION OF HOUSEHOLD INCOME AND WEALTH

by Luigi Infante, David Loschiavo, Andrea Neri, Matteo Spuri, Francesco Vercelli *

Abstract

We assess the impact of the 2022 inflationary shock on Italian households' wealth along the joint distribution of income and net wealth. The analysis was carried out by dividing households into four groups based on their median income and net wealth, using a methodology similar to the Distributional Wealth Accounts developed at European level. The erosion of the real value of net financial wealth due to inflation was heterogeneous across households. While capital losses were small for the least wealthy households, for the wealthiest group they exceeded one tenth of annual disposable income. Conversely, the reduction in the real value of financial liabilities allowed the group of households with high income and low net wealth to realize a capital gain of nearly one tenth of their income.

JEL Classification: D14, D31, D51, E31.
Keywords: distributional wealth accounts, inflation, joint income and wealth distribution.
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Contents

* Bank of Italy, Directorate General for Economics, Statistics and Research.

1. Introduction[1]

This note assesses the heterogeneous impact of the 2022 inflationary shock on Italian households grouped according to their joint income and wealth.

Inflation can have significant distributional effects on different socio-economic groups in the economy. It disproportionately impacts lower-income households since they tend to spend a higher fraction of their budget on necessities, such as food, gasoline, and heating. Moreover, lower-income households typically rely on social benefits and transfers and the adjustment of payment transfers by governments is relatively slow. In contrast, higher-income families spend a higher fraction of their income on luxury goods and have more savings, making it easier to weather such shocks. Inflation losses are also more significant for recipients of a source of income characterized by imperfect indexation than for households who can rapidly adjust their earnings to new prices.

The distributive effects of inflation also depend on the household's portfolio composition. Households whose assets have a fixed nominal value are less insulated from inflation than those holding assets valued at market prices. Moreover, indebted households gain from the reduction of the real value of outstanding debts, and for those who pay a fixed rate, the debt service burden decreases as long as their income keeps up with inflation.

Summing up, inflationary redistribution of income and wealth depends on many factors, such as institutional ones, the differences in consumption baskets, the structure of households' assets and liabilities, or the access to credit.

Following a prolonged period of low and stable inflation, the 2021-22 consumer prices surge has hit many countries unexpectedly.[2] In Italy, the y-o-y growth rate of the Harmonised Index of Consumer Prices reached 12.3 per cent in December 2022 (the highest value since the mid-Eighties and about 3 p.p. more than the euro area average). Using microsimulation analysis, Curci et al. (2022) show that the incidence of the inflationary shock for Italian households belonging to the first quintile of income was higher, both gross and net of Government interventions, than that experienced by households belonging to the last quintile. This was due to remarkable differences in the consumption baskets and households' heterogeneous exposure to the price increases.

Less is known about the heterogeneous impact of the 2022 inflation shock on Italian households' wealth. While income and wealth are undoubtedly correlated, there is ample evidence in the literature of a sizable share of wealthy households that are at the bottom of the income distribution as well as of a non-negligible percentage of high-income households with relatively

[1] We thank Andrea Brandolini, Silvia Fabiani, and Alfonso Rosolia for their useful comments.
[2] For an analysis of the causes at the root of the recent consumer price index spike, also from a historical perspective, see Visco (2023), pp. 13-35.

low net financial assets (see, for instance, Kaplan et al., 2014). Moreover, along the wealth distribution, there are also remarkable differences in asset composition, especially among financial assets more or less protected from a surge in inflation (Bank of Italy, 2022).

This analysis quantifies the inflation losses for household groups classified by income and wealth. Such an assessment helps provide insights into the expenditure and savings patterns likely to occur in the coming months, shedding more light on the threats posed by the price shock to economic growth. For instance, the extent to which households can cushion the erosion of their purchasing power hinges on the amount of wealth they can disinvest to smooth their consumption and on the exposure of the real value of their assets to inflation. The distributional effects of inflation on income and wealth across the population are also significant for monetary policy decisions.

Survey data are the traditional source of distributional information on income and wealth, but they are available at low frequency. The latest survey information from the Survey on Household Income and Wealth (SHIW) refers to 2020. Moreover, wealth information available in surveys commonly suffers from the difficulty in enrolling wealthy households and from the under-reporting of holdings. Because of these issues, the coverage of national aggregates obtained from survey-based statistics is generally low. To overcome the lack of high-frequency information on the distribution of households' wealth and to get a better representation of the distribution of national aggregates, we use a methodology similar to the Distributional Wealth Accounts (DWA) developed by the ECB Expert Group on Distributional Financial Accounts, briefly described in Appendix A. For sake of simplicity we will refer to it simply as DWA. The methodology allows us to impute higher-frequency data from lower-frequency observations and to obtain survey-based statistics consistent with national accounts figures. The adopted procedure interpolates and forecasts the SHIW data in the quarters when only Sector National Accounts are available. Importantly, at the current juncture, DWA allow us to quantify the effect of the sudden inflation surge on outstanding amounts that include the liquid wealth accumulated involuntarily during the pandemic years; this would not have been possible relying only on survey data, which refer to 2020.

To briefly anticipate our main results, we find a widely heterogeneous impact of the inflation shock across the joint income and wealth distribution. Households with income above the median and net wealth below the median benefited in terms of net financial wealth, mainly due to the gains implied by the reduction in the real value of outstanding debt. On the contrary, all other households suffered from the inflation shock, with higher losses on net financial wealth recorded by households with income below the median and net wealth above the median.

2. The impact of inflation on wealth in 2022

In 2022 households' savings, both as a percentage of disposable income and in absolute terms, fell compared to the exceptional levels recorded during the Covid-19 pandemic, returning roughly in line with the (pre-pandemic) recent readings. Net lending – the amount of savings allocated to financial instruments – had a similar pattern. Households increased their deposits, albeit at a much slower pace than in 2020-21, and holdings of debt securities, whose net acquisitions accelerated significantly while selling off equity and mutual fund shares. Net lending was more than compensated by holding losses on shares and other equity, mutual fund shares, and technical reserves, resulting in a drop in net financial wealth. This notwithstanding, overall net wealth[3] remained mostly unchanged compared to 2021, thanks to the positive housing price developments. However, these developments refer to flows and stocks at current prices: against a 12.3 per cent y-o-y growth of consumer prices,[4] net wealth evaluated at constant prices recorded an 11.4 per cent decline.

To assess how inflation affects net wealth, we can broadly group assets and liabilities into two categories: those whose reimbursement value is set in advance in nominal terms, and therefore is directly affected by inflation (deposits, debt securities, outstanding debts) and those whose market value adjusts for inflation.[5] We define the former group as "highly-exposed to inflation". From the households' point of view, high inflation produces losses in real terms on deposits and debt securities and gains on the value of outstanding debt (holding interest rates constant). Therefore, net financial wealth – defined as gross wealth less financial liabilities – may increase in real terms if gains stemming from the reduction of the real value of debts exceed losses from deposits and debt securities holdings.

To see how this distinction helps understand net wealth developments at constant prices, let E represent the instruments "highly-exposed to inflation", NE the stock of those whose value is set by the market and q their current price. Let us also assume that the price q evolves according to

$$q_1 = q_0(1+\pi)(1+\mu)$$

[3] The definition of net wealth in this paper follows the one adopted in the DWA. For more details, see Appendix A.
[4] Since we analyse end-of-the-year outstanding amounts, we consider the annual inflation from December 2021 to December 2022.
[5] In this analysis, we consider instruments whose market value adjusts for inflation: real assets; shares and other equity; mutual fund shares; insurance technical reserves. Debt securities have a hybrid status: their reimbursement value is set in nominal terms – so that it is directly affected by inflation – but their prices are set by the market. In this analysis we include debt securities among instruments that are highly exposed to inflation, assuming that households hold them until reimbursement time. However, since debt securities represented only 2 per cent of household gross wealth in 2021, results would remain substantially unchanged by including them in the group of instruments whose market value adjusts for inflation.

where π is inflation and μ are "real" factors shaping the price of these instruments. For simplicity, assume there are only two periods, so that "at constant prices" equals "previous period prices". Therefore, net financial wealth today (W_1) at constant prices can be written as:

$$\frac{W_1}{(1+\pi)} = \frac{E_1}{(1+\pi)} + \frac{q_1 NE_1}{(1+\pi)} =$$

$$= \frac{E_0}{(1+\pi)} + \frac{\Delta E_1}{(1+\pi)} + q_0(1+\mu)NE_0 + q_0(1+\mu)\Delta NE_1 \qquad (1)$$

The first and the third terms in equation (1) represent the outstanding amounts at the end of the previous period for exposed and not exposed wealth respectively, while the second and the fourth terms refer to the rebalancing of the portfolio by households, namely the transactions during the relevant period[6] (see Appendix B for more details about this decomposition). Relating these quantities to net wealth in the previous period allows decomposing the growth in net wealth at constant prices into the erosion component, the rebalancing component, and the developments in asset prices.

Equation 1 also shows that the impact of these forces depends on the composition of the portfolio. In the following we use the DWA data complemented with imputed 2022 household incomes (see Appendix A) to document portfolio heterogeneity along the distribution of income and wealth and, subsequently, to quantify the differential impact of the inflation surge.

To this end, we distinguish four groups of households as follows:

1. households with both income and net wealth below their respective median values;
2. households with income above the median and net wealth below the median;
3. households with income below the median and net wealth above the median;
4. households with both income and net wealth above their respective median values.[7]

Table 1 describes the composition of gross wealth and income across the four groups. As we are interested in the effects of the 2022 inflation surge on household wealth, we document the composition of outstanding amounts at the end of 2021.[8] Incidentally, this also highlights the importance of high-frequency DWA that incorporate available aggregate information. We can study the distributional effects of the inflation surge having accounted for the large (and partly involuntary)

[6] The decomposition, based on annual data, assumes that transactions take place at the beginning of the period, and for this reason, they are deflated by the annual rate of inflation $(1+\pi)$. Quarterly data might be used to weaken this assumption, since they capture more precisely the moment when transactions happen. However, as it will be shown in Table 2, the contribution of transactions to the growth rate of net financial wealth is generally lower than the contribution of the previous-year stock.

[7] Given the data limitations discussed in Appendix A, median household income refers to 2022 imputed incomes to 2022. Median net wealth refers instead to 2021.

[8] Differently, to document household income composition before the inflation surge we use the 2016 wave of the SHIW since income levels and composition in the 2020 wave were heavily impacted by the pandemic and the policy responses.

Table 1 – Composition of wealth and income (1)

	Weight of groups				Composition of hh wealth in 2021 (% gross wealth of group)					Composition of hh income in 2016 (% hh income of group)				
	% sample observations	% populations	% net wealth	% hh income	% non fin assets	% deposits	% debt sec	% other fin ass	% liabilities (2)	% labour inc.	% self-employment inc.	% pensions	% other transfers	% capital income (3)
net wealth < median net wealth	36.8	50.0	7.5	27.5	78.2	17.9	0.7	3.2	22.5	53.5	4.4	27.5	0.7	14.0
hh income < median hh income	*25.8*	*36.7*	*5.1*	*14.8*	*75.9*	*20.9*	*0.8*	*2.4*	*6.8*	*44.7*	*3.4*	*35.7*	*0.6*	*15.5*
hh income > median hh income	*11.0*	*13.3*	*2.4*	*12.7*	*81.2*	*14.0*	*0.6*	*4.2*	*42.5*	*63.1*	*5.4*	*18.5*	*0.7*	*12.2*
net wealth > median net wealth	63.2	50.0	92.5	72.5	54.4	12.5	2.3	30.8	5.7	35.9	14.0	26.9	0.1	23.1
hh income < median hh income	*11.2*	*13.3*	*8.7*	*6.5*	*77.6*	*12.6*	*1.6*	*8.3*	*1.8*	*18.7*	*9.0*	*40.6*	*0.4*	*31.3*
hh income > median hh income	*52.0*	*36.7*	*83.8*	*66.0*	*52.1*	*12.5*	*2.4*	*33.1*	*6.0*	*38.3*	*14.7*	*25.0*	*0.0*	*22.0*
Total	100.0	100.0	100.0	100.0	56.5	13.0	2.2	28.3	7.2	41.9	10.8	27.1	0.3	20.0

Notes: (1) Households are classified according to their median wealth in 2021. Given the data limitations discussed in Appendix A, median household income refers to 2022 imputed 2022incomes. (2) It includes only loans from banks and other financial institutions. (3) Income from real estate assets (including imputed rents) and net financial revenues.

increase in liquid wealth observed during the pandemic years. Absent DWA, we would have to rely only on the available survey data, which refers to 2020, thus missing an important element of the picture.

The composition of wealth differs substantially across income and wealth levels. According to DWA estimates, at the end of 2021, real assets were the predominant share of the gross wealth of low-wealth households (regardless of their position in the income distribution) and of high-wealth households with income below the median (between 76 and 81 per cent; Table 1); these latter households draw nearly half of their incomes from pension transfers. Conversely, high-wealth households in the upper half of the income ladder held a larger share of their gross wealth in financial assets (about 48 per cent); reliance on self-employment income is higher for this group of households who nonetheless display the highest degree of diversification across income sources. Liabilities represent a much larger share of gross wealth for households with net wealth below the median and incomes above the median; these households draw nearly two-thirds of their income from salaried employment.

Given these differences, the inflation surge in 2022 had heterogeneous effects on the outstanding amounts. Net wealth fell in real terms in all four groups (Table 2, column 1). The reduction amounted to nearly one-fifth of annual income for households with high income and low wealth and one-fourth for those with low levels of both income and wealth. Instead, for households in the upper part of the net wealth distribution, the reduction in the real value of net wealth in 2022 was larger than their annual incomes. Net financial wealth at constant prices (Table 2, column 2) slightly increased (2.9 per cent) for households with high income and low net wealth, because the reduction of the real value of their financial assets was more than offset by the large decline, in real terms, of the outstanding amount of their financial liabilities.

Columns 3 to 6 in Table 2 report the contributions of the four components outlined in equation (1) to the growth rate of the deflated net financial wealth for each household group.

The contribution of the previous-year stock exposed to inflation to the variation of net financial wealth (column 3) was negative for all the groups but the high-income and low-wealth ones. The negative contribution was higher (in absolute value) for the low-income and low-wealth groups, than wealthier households. This result is not surprising given that households in the lower part of the wealth distribution mainly hold deposits. Instead, for high-income households in the lower part of the net wealth distribution, the contribution of the 2021 stock exposed to inflation was positive, because they obtained a gain stemming from their outstanding debts.

Table 2 – Net wealth and inflation impact

(percentages)

	Growth rate between 2021 and 2022 at constant prices[1]		Contribution of instruments to net financial wealth growth (2021-2022) by exposure to inflation at constant prices[3]				Inflation gains and losses in 2022 on financial instruments exposed to inflation over income	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Net wealth	Net financial wealth[2]	Previous-year stock exposed to inflation	Change of stock exposed to inflation	Previous-year stock not exposed to inflation	Change of stock not exposed to inflation	Gross financial wealth	Net Financial wealth
net wealth < median net wealth	-10.4	-137.3	-3.7	-23.3	-95.1	-15.2	-6.3	1.3
hh income < median hh income	*-9.8*	*-12.6*	*-7.2*	*-2.3*	*-2.6*	*-0.5*	*-7.6*	*-5.2*
hh income > median hh income	*-11.6*	*2.9*	*6.4*	*0.7*	*-3.7*	*-0.5*	*-4.7*	*8.9*
net wealth > median net wealth	-11.4	-18.1	-3.2	1.0	-13.8	-2.1	-19.2	-11.9
hh income < median hh income	*-10.2*	*-15.1*	*-6.3*	*0.4*	*-7.8*	*-1.4*	*-18.4*	*-16.1*
hh income > median hh income	*-11.6*	*-18.2*	*-3.0*	*1.1*	*-14.1*	*-2.2*	*-19.3*	*-11.4*
Total	-11.4	-18.3	-3.2	1.0	-13.9	-2.2	-15.6	-8.2

Notes: (1) Base year = 2015. (2) The growth rate for households with net wealth below the median does not lie between the corresponding values of the two income-subgroups. The reason being that high-income low-wealth subgroup has negative net financial wealth while the low-income low-wealth subgroup has positive net financial wealth. In aggregate, the two amounts almost offset each other bringing the denominator close to zero and, in turn, magnifying the growth rate. (3) The sum of columns 3 to 6 equals column 2.

Also in the case of the change of stock exposed to inflation (column 4), the contribution to the variation in net financial wealth was negative for the low-income and low-wealth groups, mainly due to the deceleration of savings accumulated as deposits. The richest group of households recorded a positive contribution, deriving from the acquisition of securities, while the positive value for high-income and low-wealth households is due to debts.

The contribution of the previous-year stock not exposed to inflation (column 5) is strongly negative for all the groups of households and increases (in absolute value) with wealth. The result is in line with the evidence that wealthy households hold larger amounts of shares, life insurance instruments, and investment fund shares that, in turn, suffered the abrupt fall of market prices. The high-income and high-wealth groups arguably also lowered savings accumulation in these products (col. 6).

Finally, to put these developments in context, we consider the value of the gains and losses due to inflation on financial instruments highly exposed to inflation and we relate it to the disposable income of each group. This gives a measure of the savings that would be needed just to keep constant the purchasing power of the financial wealth most exposed to price developments (Table 2, columns 7 and 8). We estimate losses on deposits and debt securities and gains on debts in 2022 by applying the inflation rate to the outstanding amounts at the end of 2021.

Concerning gross financial wealth, high-income households in the lower part of the net wealth distribution suffered the lowest inflation losses (4.7 per cent of income), while for households above the median of net wealth inflation losses reached almost 20 per cent of income.

Differently, the direct impact of inflation on net financial wealth was positive for high-income households with low net wealth (8.9 per cent of income). For them, gains from the reduced real value of outstanding debts more than offset the losses on financial assets. Losses were slightly above 10 per cent of income for households in the upper part of the net wealth distribution, and particularly high for low-income households (16.1 per cent of income).

3. Conclusions

Following a prolonged period of low and stable inflation, the 2021-22 consumer prices surge has hit many countries unexpectedly. Inflation has a heterogeneous effect among different population groups. The impacts are generally stronger in the case of lower-income households, since they tend to spend a higher fraction of their budget on necessities. In contrast, higher-income families spend a higher fraction of their income on luxury goods and have more savings, making it easier to weather

such shocks. The distributive effects of inflation also depend on the portfolio composition. Households whose assets have a fixed nominal value are less insulated from inflation than those holding assets valued at market prices. Moreover, indebted households gain from the reduction of the real value of outstanding debts, and for those who pay a fixed rate, the debt service burden decreases as long as their income keeps up with inflation.

In this paper, we have analyzed the impact of the 2022 inflation shock on Italian households' wealth along the joint distribution of income and wealth. Results show that the decrease in household net wealth at constant prices displayed small differences between the bottom and the top part of its distribution. However, in terms of annual disposable income, the drop ranged between 20 and 25 per cent for households with net wealth below the median and was larger than 100 per cent for households with net wealth above the median. The erosion of net financial wealth due to inflation amounted to just over one tenth of annual disposable income for households in the upper part of the net wealth distribution; for those with income below the median, it was even larger, at 16 per cent of income. On the contrary, high-income households with low net wealth gained from inflation (9 per cent of income) since they benefited from the erosion of the real value of their outstanding debt.

References

Ahnert, H., Kavonius, I. K., Honkkila, J., and Sola, P., 2020. Understanding household wealth: linking macro and micro data to produce distributional financial accounts. Statistics Paper Series 37, European Central Bank.

Bank of Italy, 2022. Survey of Household Income and Wealth - 2020, Statistics, July 2022.

Cantarella, M., Neri, A., and Ranalli, G. (2023). Estimating the distribution of household wealth: methods for adjusting survey data estimates using national accounts and rich list data, Review of Income and Wealth, *forthcoming*.

Curci, N., Savegnago, M., Zevi, G. and Zizza, R., 2022. The redistributive effects of inflation: a microsimulation analysis for Italy. Questioni di Economia e Finanza (Occasional Papers) 738, Bank of Italy.

D'Alessio, G. and Neri, A., 2015. Income and Wealth Sample Estimates Consistent with Macro Aggregates: Some Experiments. Questioni di Economia e Finanza (Occasional Papers) 272, Bank of Italy.

Engel, J., Riera, P. G., Grilli, J., and Sola, P., 2021. Developing Reconciled Quarterly Distributional National Wealth – Insight into Inequality and Wealth Structures. Working Paper Series, no. 2687, European Central Bank.

Kaplan, G., and Violante, G. L. and Weidner, J., 2014. The Wealthy Hand-to-Mouth, Brookings Papers on Economic Activity, vol. 2014(1), pages 77-138.

Neri, A. and Ranalli, M. G. (2011). To misreport or not to report? The measurement of household financial wealth. Statistics in Transition, 12(2): 281--300.

Visco, I. 2023. *Inflazione e politica monetaria*. Laterza, Anticorpi, Bari, Italy.

Appendix A: Linking survey data with national accounts

During the past years, several initiatives have combined survey data with macroeconomic aggregates from national accounts to produce more reliable and timely statistics on the distribution of household income and wealth. The G20 Data Gaps Initiative (DGI) phases have highlighted the importance of such distributional information. The third phase, launched in 2022, has created an expert group with the mandate to develop an internationally agreed methodology for the compilation of distributional results on wealth by 2024. In 2015, the European Central Bank established an expert group with the mandate to understand, quantify and explain the main differences between the Household Finance and Consumption Survey (HFCS) and the Financial Accounts (FA) and to develop distributional information on household wealth (Ahnert et al., 2020). The work continued in 2019 thanks to the ECB Expert Group on Distributional Financial Accounts, which has fully implemented an estimation method to compile experimental quarterly results both for several European countries and the Euro area as a whole (Engel et al., 2022; Cantarella et al., 2023). Surveys on household income and wealth commonly suffer from two quality issues: the difficulty in enrolling wealthy households and respondents' reticence to report their incomes and assets honestly (see, for instance, Neri and Ranalli, 2011). Because of these issues, the coverage gap – i.e., the ratio of aggregates obtained from survey-based statistics and the corresponding macroeconomic figures from the national account balance sheet – is generally low. This gap requires the development of a methodology to redistribute the missing wealth (i.e., the difference between national accounts and totals from survey data) among the households in the survey. Assumptions are necessary in the absence of reliable external information (D'Alessio and Neri, 2015), such as administrative records.

The Distributional Wealth Accounts (DWA), developed by the ECB Expert Group on Distributional Financial Accounts, provide distributional information on household wealth since 2010 by combining the HFCS survey data with national accounts. The ECB will make the first results publicly available in December 2023. The methodology mainly consists of three steps (for a detailed overview see Engel et al., 2022, and ECB 2020).

The first step in the production of DWA is the assessment of instrument-specific comparability between the two sources of information. As a result of this comparison, the methodology considers wealth components that account for about 90% of the total assets and liabilities of the households. Some items, such as currency, pension entitlements, and other accounts, are excluded because they are unavailable in one of the two sources or because of comparability issues.

The second step consists of several adjustments to the HFCS microdata to account for the differences between survey-based aggregates and the corresponding macroeconomic figures. For instance, regarding deposits, the DWA methodology identifies outlier observations (i.e., when deposit holdings are minimal compared to household income and/or the share of the household portfolio held as deposits is too tiny, namely income criterion and asset criterion, respectively). Then, it replaces them with the average values from other observations. Furthermore, the poor coverage of the wealthiest households is addressed by exploiting information on the most affluent households from Forbes' rich list and assuming that the right tail of the wealth distribution follows a Pareto distribution. Then, a sample of synthetic households is extracted from that distribution and added to the HFCS data. Finally, in the third step, the methodology covers the remaining gap through a proportional allocation, grossing up the totals from the DWA sample to the level of the sector accounts for each instrument. The previous steps enable the alignment of micro and macro data when both information are available and produce a synthetic database for computing any distributional statistics of interest.

These indicators are then interpolated and extrapolated based on the information derived from the quarterly national accounts to produce quarterly time series on the distribution of household wealth (third step).

The DWA statistics used in this note are based on the 2020 wave of the SHIW. They include distributional information on the outstanding amounts of household wealth by instruments, net wealth decile, housing status, and occupational status. However, breakdowns by household income are not currently available.

In this study, we are interested in assessing the impact of inflation on wealth in 2022 for different groups of households characterized by varying net wealth and income levels. Therefore, we have to estimate the joint distribution of income and wealth in 2022. We do so by using two methods depending on the type of income. First, we estimated incomes from financial investment by multiplying the outstanding values of financial instruments in 2022 from the DWA by market indicators on interest revenues. For the other income sources, we exploit the recently available and preliminary information on 2,918 panel households that have already been interviewed for the 2022 SHIW wave, currently being carried out. Some descriptive statistics on income and wealth for these observations are available in Table A1.

Table A1 – Descriptive statistics on the 2020 SHIW sample

	N	p25	p50	Mean	p75	SD
Not available in 2022						
Disposable income in 2020	3,314	19,500	29,600	41,638	47,940	46,396
Total net wealth	3,314	55,061	154,200	373,678	339,000	1,014,710
Available in 2022						
Disposable income in 2020	2,925	16,940	26,350	36,731	43,250	42,556
Total net wealth	2,925	55,000	144,001	294,382	277,500	882,668

We estimated the following regression model for the growth rate of disposable income (excluding financial revenues) between 2020 and 2022:

$$y_i = \alpha + \sum_{j=1}^{K} \beta_j \cdot x_{i,j} + \epsilon_i$$

where y_i represents the growth rate of disposable income between 2020 and 2022[9] for household *i*, $x_{i,j}$ the j-th variable among the set of K covariates for household i, ϵ_i the idiosyncratic error. The covariates used in the estimates, and based on 2020 data, include the number of income recipients, age and the sex of the main income recipient, education, sector of occupation, employment status (white/blue collar, self-employed, retiree, unemployed), geographical area of residence, household composition, outstanding amounts of debts, dummies on income decile and wealth decile. We also consider different combinations of interactions among the available variables. This model is then used to impute the 2022 disposable income net of financial revenues for the remaining households (i.e., those in the 2020 SHIW wave but not yet interviewed in the 2022 SHIW wave).

Table A2 reports the estimates from six models using different sets of covariates. We are primarily interested in the ability of the model to predict the growth rate of disposable income. To select the model with the highest prediction performance, we perform a 10-fold cross-validation, and we compute the average Root Mean Squared Error (RMSE) across folds.[10] We choose the model in column 2, since it reports the lowest RMSE. Models in columns 3 to 6 include larger sets of

[9] The growth rate is winsorized at the 5% level.

[10] The procedure starts by splitting the sample into 10 equally-sized groups. Next, the regression is performed using only 9 groups out of 10; then, the estimated coefficients are applied to the tenth group, and the RMSE is stored. This step is replicated, leaving out one group at each stage. Ultimately, we take the average of the RMSEs obtained at each step. The lower the average RMSE, the better the model.

covariates[11], delivering better in-sample predictions (higher R^2) but poorer out-of-sample predictions.

Table A2 – Regressions on the growth rate of income between 2020 and 2022.

	(1) b/se	(2) b/se	(3) b/se	(4) b/se	(5) b/se	(6) b/se
Sex of the main income recipient	5.620*	5.586*	5.648*	5.910*	8.480***	7.465**
	(3.3052)	(3.3074)	(3.2726)	(3.2248)	(3.1462)	(3.1175)
Age of the main income recip.	-0.066	-0.123	-0.116	-0.052	-0.037	-0.076
	(0.1515)	(0.1574)	(0.1549)	(0.1447)	(0.1410)	(0.1458)
No. income recipients	-1.490	-1.209	-1.715	0.699	-1.181	-0.135
	(2.5900)	(2.6328)	(2.6883)	(2.5108)	(2.4289)	(2.4485)
White collar	22.137***	19.247***	26.995***	22.558***	19.746**	15.369
	(6.3774)	(6.5281)	(10.1792)	(6.3207)	(7.9635)	(19.3179)
Self-employed	20.128***	14.415**	12.039	20.977***	6.864	-48.635
	(5.6760)	(5.7831)	(10.9418)	(5.1281)	(36.1355)	(50.9941)
Retiree	-0.733	-1.164	1.325	2.947	68.525*	14.410
	(9.3602)	(8.7893)	(14.3511)	(9.6514)	(35.0381)	(18.9471)
Unemployed	-2.315	-2.942	-2.959	-0.183	83.379**	-18.261
	(10.7406)	(10.4975)	(26.1198)	(12.3019)	(33.0240)	(14.1869)
North-East	-0.643	-1.337	-18.069	-32.385	-14.737	13.225
	(3.7214)	(3.7583)	(24.3487)	(34.6850)	(30.0594)	(29.2801)
Center	-7.755**	-7.991**	-4.441	-38.383	-28.215	-32.878*
	(3.7545)	(3.7430)	(37.3427)	(33.9263)	(28.3102)	(19.0094)
South and Islands	-8.463**	-7.950*	-15.553	7.308	14.061	-22.816
	(4.1495)	(4.0868)	(27.6642)	(31.9225)	(28.0762)	(15.4926)
Secondary	3.900	2.746	3.112	2.882	3.085	5.712
	(3.5501)	(3.5189)	(3.3772)	(3.2589)	(3.1468)	(3.4913)
College	11.538***	10.013**	10.756**	10.387**	10.377**	11.989***
	(4.3990)	(4.4234)	(4.3884)	(4.2598)	(4.0790)	(4.4213)
Single <65y	-2.670	-3.764	-3.077	20.946	20.465	19.582
	(7.4199)	(7.2577)	(7.1392)	(22.6022)	(27.7048)	(17.7699)
Couple w/o kids	13.393**	13.441**	14.136***	27.944	19.764	28.238**
	(5.3351)	(5.2189)	(5.1403)	(19.8489)	(24.8223)	(12.3383)
Couple with kids	13.522*	14.471**	14.989**	35.506	6.781	47.610**
	(7.1599)	(6.9827)	(6.9574)	(25.0301)	(30.0065)	(18.5968)
Single with kids	-1.878	-0.468	-0.509	-3.109	-4.987	44.478**
	(7.9983)	(7.9012)	(7.8656)	(23.7757)	(25.4886)	(20.4606)
Other type of households	0.285	1.434	2.667	9.319	6.167	25.994
	(8.2981)	(8.1475)	(8.1795)	(24.4806)	(27.8353)	(24.4367)
Log of outstanding debt		0.279	0.291			
		(0.3255)	(0.3271)			
Constant	75.919***	71.955***	80.046***	58.125*	139.945***	41.355
	(17.1770)	(17.2420)	(24.7372)	(32.6195)	(34.3499)	(26.0269)
Dummy occupational sector	YES	YES	YES	YES	YES	YES
Dummy income decile	YES	YES	YES	YES	YES	YES
Dummy net wealth decile		YES	YES			YES
Interactions*			YES	YES	YES	YES
Adjusted R^2	0.138	0.148	0.150	0.175	0.217	0.223
R2	0.147	0.160	0.171	0.204	0.268	0.276
10-fold CV RMSE (ave)	44.571	44.400	45.258	45.610	49.383	47.943
Observations	2918	2918	2918	2918	2918	2918

*Model 3: interactions between area of residence and both occupational sector and employment status. Model 4: interactions between Dummy income decile and both area of residence and household composition. Models 5 and 6: interactions between Dummy income decile and area of residence, household composition, occupational sector and employment status.
Note: the omitted variables are: Male; Blue collar; North-West; Middle school or less; Single >65y.

[11] In particular, model 3 includes interactions between the area of residence, occupational sector, and employment status. Model 4 contains interactions between income deciles and the area of residence and household composition. Finally, models 5 and 6 include interactions between income deciles and area of residence, household composition, occupational sector, and employment status.

Finally, we use the coefficients from model 2 to predict the growth rate of disposable income for households not observed in 2022[12] and we recover an estimate of 2022 disposable income. As shown in the descriptive statistics of Table A1, the group of unobserved households display higher incomes and wealth in 2020.

As explained before, the DWA sample also includes synthetic households sampled from an estimated Pareto distribution of net wealth. We do not observe income or any demographic characteristics for these households, which belong to the wealthiest part of the distribution. Therefore, we estimate their income in 2022 by attributing the average income in the richest decile. The total disposable income from aggregating the DWA sample represents 93 per cent of national aggregates. Finally, we apply a proportional allocation to gross up incomes in the microdata to match national totals.

[12] We winsorize the predicted value of the growth rate of income at the 5% level to avoid extreme values.

Appendix B: the decomposition of the growth rate of net financial wealth

Let W_{t+1} be the stock of net financial wealth at the end of period "t". It is defined as the outstanding amount M of financial assets net of financial liabilities. In the Financial Accounts (FA), the outstanding amounts are expressed at market prices, with the exception of instruments like deposits or loans reported at nominal value (this value coincides with the reimbursement value). As a consequence, instruments having a fixed reimbursement value turn out to be more exposed to the erosion due to the inflation.

The market value of each instrument can be expressed as the product of the financial price (q) by the issued quantity (K) as follows:

$$W_{t+1} = \sum_{j=1}^{J} M_{j,t+1} = \sum_{j=1}^{J} q_{j,t+1} K_{j,t+1} \quad (1)$$

We assume that the price of a financial instrument varies from one period to the other for two reasons, inflation (π) and "real" factors (μ), according to the following formula:

$$q_{j,t+1} = q_{j,t}(1 + \pi_{t,t+1})(1 + \mu_{j,t+1}) \quad (2)$$

where $1 + \pi_{t,t+1} = 1 + \frac{p_{t+1} - p_t}{p_t} = \frac{p_{t+1}}{p_t}$ and "p" represents the price level.

When the inflation rate is referred to the base period "0" ($p_0 = 1$), then $1 + \pi_{0,t+1} = \frac{p_{t+1}}{p_0} = p_{t+1}$.

For the instruments at nominal value, we ideally consider its market price constant and equal to one over time:

$$q_{t+1} = q_t = 1.$$

We can rewrite the outstanding amount at market prices as:

$$M_{j,t+1} = q_{j,t+1} K_{j,t+1} = q_{j,t+1} [K_{j,t} + (K_{j,t+1} - K_{j,t})] =$$

$$= q_{j,t}(1 + \mu_{j,t+1})(1 + \pi_{t,t+1}) K_{j,t} + q_{j,t}(1 + \mu_{j,t+1})(1 + \pi_{t,t+1}) \Delta K_{j,t+1},$$

in order to highlight two components:

1. the first one refers to the previous-year stock valued at current t+1 prices;
2. the second component refers to the variation of t+1 stocks valued again a current t+1 prices, which is a proxy for the transactions that take place during t+1 and aims to capture the change in the portfolio composition.

Let $\widetilde{M_{j,t+1}} \equiv \frac{M_{j,t+1}}{p_{t+1}} = \frac{M_{j,t+1}}{(1+\pi_{0,t+1})}$ be the outstanding amount of a financial instrument at constant prices (with base period "0"). We can rewrite it as:

$$\widetilde{M_{j,t+1}} = \frac{q_{j,t}(1 + \mu_{j,t+1})(1 + \pi_{t,t+1}) K_{j,t}}{(1 + \pi_{0,t+1})} + \frac{q_{j,t}(1 + \mu_{j,t+1})(1 + \pi_{t,t+1}) \Delta K_{j,t+1}}{(1 + \pi_{0,t+1})}$$

$$= \frac{q_{j,t}(1 + \mu_{j,t+1}) K_{j,t}}{(1 + \pi_{0,t})} + \frac{q_{j,t}(1 + \mu_{j,t+1}) \Delta K_{j,t+1}}{(1 + \pi_{0,t})}$$

$$= (Component\ 1)_{j,t+1} + (Component\ 2)_{j,t+1} \quad (3)$$

Where we used the following simplification: $\frac{(1+\pi_{t,t+1})}{(1+\pi_{0,t+1})} = \frac{\frac{p_{t+1}}{p_t}}{\frac{p_{t+1}}{p_0}} = \frac{1}{\frac{p_t}{p_0}} = \frac{1}{(1+\pi_{0,t})}$

In DWA we do not observe neither financial asset prices nor the transactions. In order to decompose the change in financial wealth, we exploit part of the information in the aggregate financial accounts. More practically, from financial accounts we may recover the quantity $\frac{q_{j,t+1}}{q_{j,t}}$, for each financial instruments, that corresponds to the gross price revaluation $(1 + r_{j,t+1})$.[13] By inverting equation (2), we may obtain the change of financial instrument due to real factors in terms of observable statistics as:

$$\left(1 + \mu_{j,t+1}\right) = \frac{(1 + r_{j,t+1})}{(1 + \pi_{t,t+1})}$$

so that the element in component 1 can be recovered as follows:

$$\frac{\left(1 + \mu_{j,t+1}\right)}{\left(1 + \pi_{0,t}\right)} = \frac{(1 + r_{j,t+1})}{(1 + \pi_{t,t+1})} \frac{1}{\left(1 + \pi_{0,t}\right)} = \frac{(1 + r_{j,t+1})}{(1 + \pi_{0,t+1})}$$

The second component in (3) can be obtained as a residual, between $\widetilde{M_{j,t+1}}$ and the first component. In the case of net financial wealth at nominal values, more exposed to inflation, as anticipated $M_t = K_t$ and the equation (3) simplifies to:

$$\widetilde{M_{t+1}} = \frac{1}{\left(1 + \pi_{t,t+1}\right)} \frac{1}{\left(1 + \pi_{0,t}\right)} M_t + \frac{1}{\left(1 + \pi_{t,t+1}\right)} \frac{1}{\left(1 + \pi_{0,t}\right)} \Delta M_{t+1} =$$

$$= \frac{1}{(1 + \pi_{0,t+1})} M_t + \frac{1}{(1 + \pi_{0,t+1})} \Delta M_{t+1}$$

In this case, the erosion of inflation on the stock and on transactions is directly evident from the formula.

Let $\widetilde{W_{t+1}} \equiv \frac{W_{t+1}}{(1+\pi_{0,t+1})}$ the net financial wealth at constant prices. We can express it as:

$$\widetilde{W_{t+1}} = \sum_{j=1}^{J} \widetilde{M_{j,t+1}} = \sum_{j=1}^{J} (Component\ 1 + Component\ 2)_{j,t+1}$$

Finally, the growth rate of net financial wealth can be decomposed into the contributions of all components for each instrument

$$\frac{\Delta\widetilde{W_{t+1}}}{\widetilde{W_t}} = \sum_{j=1}^{J} \left[\frac{\Delta(Component\ 1)_{j,t+1}}{\widetilde{W_t}} + \frac{\Delta(Component\ 2)_{j,t+1}}{\widetilde{W_t}} \right]$$

[13] As gross price revaluation we use the average financial instrument price growth.

We then aggregate the contributions of the instruments more exposed to inflation (deposits, debt securities and loans) and those less exposed to inflation (shares and other equity, mutual fund shares, insurance technical reserves).