The Heterogeneous Impact of Inflation on Households' Balance Sheets

Miguel Cardoso (BBVA) Clodomiro Ferreira (BdE) José Miguel Leiva (BBVA) Galo Nuño (BdE) Álvaro Ortiz (BBVA) Tomasa Rodrigo (BBVA) Sirenia Vazquez (BBVA)

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What are the costs of inflation born by households?

- A question with a history of at least 60 years, since works by Friedman and Tobin in the 1950's and 1960's
- Answer crucially depends on:
 - Features of the inflation surge
 - wether expected or unexpected...
 - ... as well as its persistence and volatility
 - Households' balance sheet and consumption basket

Context: the surge in inflation in 2021...

Figura: Evolution of HICP and components in Spain



... was unexpected and perceived as temporary

Cuadro: Inflation expectation indicators for 2021 and 2022

	Dec. 2020		Jun. 2021	
	2021	2022	2021	2022
Survey of Professional Forecasters*	0.6	1.2	1.7	1.2
ECB projections	0.6	1.2	1.9	1.2
Inflation-linked swaps (ILS)**	1.0	0.9	1.8	1.3
Consumer Expectations Survey***	2.0	-	2.0	
Realized annual inflation	6.6	n.a.	6.6	n.a.

Source: Survey of Professional Forecasters, ECB, Bloomberg. Note: in pp.

* For 2022 we employ the January 2021 survey.

 ** ILS instantaneous forward rates for Euro area inflation in Dec. 21 / 22

*** Median response about "which 12-month ahead Euro area do you expect?"

In the next 30 minutes...

Characterize how a shock to inflation impacts the a person's wealth

- Thought experiment: unanticipated and temporary shock
- Focus on households
- Provide a simple decomposition into three channels:
 - Fisher channel
 - nominal income channel, and
 - consumption inequality channel.
- Estimate these channels for Spain in 2021 using two datasets:
 - Representative surveys: the Encuesta de Presupuestos Familiares (EPF), and the Encuesta Financiera de las Familias (EFF).
 - Proprietary data: BBVA client data (bank accounts, bill payments and credit/card expenses), already exploited by Carvalho et al. (2021) and Buda et al., (2022).

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Analytical framework

$$P_{t+1a_{j,t+1}} = m_{j,t} + \left(1 + \frac{\Delta Q_{t+1}}{Q_t} + i_t\right) Q_t d_{j,t} + \left(1 + \frac{\Delta q_{t+1}}{q_t} + r_{t+1}^s + \pi_{t+1}\right) P_t q_t s_{j,t}$$
$$- \left(1 + \frac{\Delta Q_{t+1}^b}{Q_t^b} + i_t^b\right) Q_t^b b_{j,t} + w_{j,t+1} - P_{t+1}C_{j,t+1}$$

where

► Cash, *m*_{j,t}

- Deposits and bonds, $d_{j,t}$ with price Q_t
- Real assets (such as stocks or housing), $s_{j,t}$ with prices q_t
- Consumer debt and mortgages, $b_{j,t}$ with prices Q_t^b
- Labour income due to wages, unemployment benefits or pension, w_{j,t}
- $P_{t+1}C_{j,t+1} = \sum_{k=1}^{K} p_{kt+1}C_{j,kt+1}$ is total consumption by the individual

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A particular inflation shock

- We consider the following experiment:
 - An unexpected, one-off price shock.
 - ② The shock is temporary

$$\pi_{t+1} > \bar{\pi}, \ \mathbb{E}_{t+1} [\pi_s] = \bar{\pi}, \text{for } s > t+1,$$

where $\bar{\pi}$ is the expected constant inflation rate \rightarrow after the shock no further change expected.

Nominal income is "sticky
 : income at t + 1 does not depend on inflation.

This set up implies:

- Nominal returns i_t, i_t^b , determined at t, dont incorporate surge in inflation
- Capital gains are independent of inflation surge, since Q_{t+1} , Q_{t+1}^{b} and q_{t+1} are forward looking

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On the assumption of sticky wages

Figura: Proportion of nominal wages in Spain that change in each month



Estimation

Proposition 1: Impact of surprise inflation

The first-order change in real wealth, at time t + 1 after a transitory inflation shock, π_{t+1} , is

$$da_{j,t+1} = \left[\underbrace{-NNP_{j,t}}_{\text{Fisher channel}} - \underbrace{w_{j,t+1}}_{\text{Nominal income channel}} - \underbrace{C_{j,t+1} \begin{pmatrix} \text{Individual inflation} \\ \overline{\pi_{j,t+1}} / \pi_{t+1} & -1 \end{pmatrix}}_{\text{Relative consumption channel}}\right] \pi_{t+1},$$

where

$$\mathsf{NNP}_{j,t} \equiv \mathsf{m}_{j,t} + \mathsf{Q}_t \mathsf{d}_{j,t} - \mathsf{Q}_t^b \mathsf{b}_{j,t},$$

is net nominal position (NNP), and

$$C_{j,t+1} \equiv \sum_{k=1}^{K} c_{j,k,t+1} \ , \ \pi_{j,t+1} \equiv \sum_{k=1}^{K} \pi_{k,t+1} \omega_{j,k,t+1}$$

are nominal consumption expenditures and individual inflation

Example

- The economy is composed by only two goods, namely books and fuel,
 - They are consumed in equal terms by the average consumer.
 - Fuel experiences a 10% inflation rate for a year, while the price of books remain constant.
 - Aggregate inflation is thus 5 %.
- Ana earns 30,000 eur per year. She has a 60,000 eur mortgage and 10,000 eur in deposits. She spends every year 20,000 euros on books and zero on fuel,
 - ▶ Its NNP is 10,000 60,000 = -50,000 eur.
 - Its nominal income is 30,000 eur.
 - lts individual inflation is 0 %. Its relative consumption is thus -20,000 eur.

Total impact:

$$da = (50,000 - 30,000 + 20,000) \times 0.05 = 2,000$$

that is, Ana benefits relatively from the inflation through the Fisher and relative consumption channel.

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Estimation

Estimation with: two representative Spanish surveys

- The Encuesta de Presupuestos Familiares (EPF) is a comprehensive expenditure survey carried out with an annual frequency by the national statistical institute (INE) since 1958, with a sample size of around 20,000 households.
 - It is the main input into the calculations of weights used to construct official inflation figures.
- The Encuesta Financiera de las Familias (EFF) instead is a representative survey collecting detailed information on household's balance sheets.
 - It is the Spanish counterpart to the Survey of Consumer Finance in the U.S., with the advantage of having a significant (rotating) panel component.
- Can't observe same individual in both samples. But Income (household and individual), as well as age are reported in both.

Estimation with: proprietary BBVA data

Analytical framework

- This dataset includes detailed granular information for BBVA clients' asset/liabilities positions as well as transactions.
- ▶ In terms of accounts and net asset positions, we are currently considering:
 - assets: current accounts and deposits.
 - ▶ liabilities: consumer loans, mortgages and credit card balances.
- In terms of identified transactions, we consider three types of payments:
 - credit and debit card payments.
 - direct debit payments.
 - 'irregular' transfers.

)	Analytical framework	Estimation	Conclusions

- Importantly, we also observe labour-related income (wages, pension payments and unemployment benefits).
- ▶ Our initial sample includes more than 4 million bank accounts. We then keep
 - (i) those non-commercial clients for which we observe non-zero labour-related income in 2021;
 - (ii) who have been BBVA clients for at least one year;
 - ▶ (iii) for whom we observe at least 10 transactions per quarter.
- ▶ This leaves us with a final sample of around 1.6 million clients observed since 2016.

Intro	Analytical framework	Estimation	Con
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are nominal consumption expenditures and individual inflation

NNPs and nominal income are of similar absolute magnitudes

Cuadro: Components by age-income groups (eur). Computed from representative surveys EFF and EPF

		Income group				
Age group		ip25	p25-p50	р50-р75	¿p75	
	Net nominal position	-4,560	-9,365	-16,297	-21,123	
i36	Nominal (labour) income					
	Relative consumption					
	Net nominal position	-8,945	-20,521	-26,452	-33,443	
36-45	Nominal (labour) income					
	Relative consumption					
	Net nominal position	-5,173	-10,136	-12,572	-16,206	
46-55	Nominal (labour) income					
	Relative consumption					
	Net nominal position	2,241	-1,553	1,430	2,073	
56-65	Nominal (labour) income					
	Relative consumption					
	Net nominal position	7,039	5,912	10,364	18,910	
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j36	Nominal (labour) income	10,461	18,960	27,827	43,149	
	Relative consumption					
	Net nominal position	-8,945	-20,521	-26,452	-33,443	
36-45	Nominal (labour) income	11,474	22,260	31,794	50,311	
	Relative consumption					
	Net nominal position	-5,173	-10,136	-12,572	-16,206	
46-55	Nominal (labour) income	11,403	22,330	32,354	52,807	
	Relative consumption					
	Net nominal position	2,241	-1,553	1,430	2,073	
56-65	Nominal (labour) income	10,436	20,893	$31,\!625$	53,742	
	Relative consumption					
	Net nominal position	7,039	5,912	10,364	18,910	
65غ	Nominal (labour) income	9,603	16,108	23,773	42,590	
	Relative consumption					

Dispersion in individual inflation rates was relatively small...

► Inflation rates by categories

Figura: Individual annual inflation rates, Dec-2021: median for each age-income group in the EPF



... implying a much smaller relative consumption effect

Cuadro: Components by age-income groups (eur). Computed from representative surveys EFF and EPF

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i36	Nominal (labour) income	10,461	18,960	$27,\!827$	43,149
	Relative consumption	-1,857	-1,237	-1,517	-2,869
	Net nominal position	-8,945	-20,521	-26,452	-33,443
36-45	Nominal (labour) income	$11,\!474$	22,260	31,794	50,311
	Relative consumption	-1,047	-838	-642	-1,756
	Net nominal position	-5,173	-10,136	-12,572	-16,206
46-55	Nominal (labour) income	$11,\!403$	22,330	32,354	52,807
	Relative consumption	-248	-200	-566	-1,346
	Net nominal position	2,241	-1,553	$1,\!430$	2,073
56-65	Nominal (labour) income	$10,\!436$	20,893	$31,\!625$	53,742
	Relative consumption	383	281	3	-520
	Net nominal position	7,039	5,912	10,364	18,910
55غ	Nominal (labour) income	9,603	16,108	23,773	42,590
	Relative consumption	1,774	1,503	997	847

Total effects

Cuadro: Total effect by age-income groups (eur). Computed from representative surveys EFF and EPF

		Income group				
Age group		ip25	р25-р50	р50-р75	¿p75	
.26	in levels	-267	-552	-661	-1,264	
130	as a % of income	-2.6 %	-2.9 %	-2.4 %	-2.9 %	
26.45	in levels	-98	-59	-310	-997	
30-45	as a % of income	-0.9 %	-0.3 %	-1.0 %	-2.0 %	
46 EE	in levels	-395	-792	-1,268	-2,327	
40-55	as a % of income	-3.5 %	-3.5 %	-3.9 %	-4.4 %	
F6 6F	in levels	-862	-1,295	-2,182	-3,650	
50-05	as a \setminus % of income	-8.3 %	-6.2 %	-6.9 %	-6.8 %	
:65	in levels	-1,215	-1,553	-2,319	-4,115	
205	as a % of income	-12.7 %	-9.6 %	-9.8 %	-9.7 %	

Results using BBVA clients are qualitatively similar

		Income group				
Age group		ip25	p25-p50	р50-р75	¿p75	
	Net nominal position	-5,133	-9,056	-10,863	-18,913	
i36	Nominal (labour) income	7,530	15,744	22,183	37,929	
	Relative consumption	-439	-135	-35	9	
	Net nominal position	-21,874	-29,618	-39,010	-48,051	
36-45	Nominal (labour) income	10,902	20,507	29,182	49,487	
	Relative consumption	-335	30	-220	27	
	Net nominal position	-8,583	-10,702	-10,468	-6,280	
46-55	Nominal (labour) income	11,421	22,149	31,788	56,558	
	Relative consumption	-149	161	345	252	
	Net nominal position	8,357	12,891	22,028	44,839	
56-65	Nominal (labour) income	11,593	$22,\!616$	32,325	59,370	
	Relative consumption	-78	189	297	449	
	Net nominal position	23,179	32,283	41,381	61,539	
¿65	Nominal (labour) income	11,160	$18,\!874$	26,402	42,490	
	Relative consumption	-446	-336	-171	-107	

Results using BBVA clients are qualitatively similar

Cuadro: Total effect by age-income groups (eur). Computed from BBVA clients' data

		Income group				
Age group		ip25	р25-р50	р50-р75	¿p75	
.26	in levels	-76	-253	-439	-735	
130	as a % of income	-24.0 %	-1.6 %	-2.0 %	-1.8 %	
26.45	in levels	437	351	371	-56	
30-45	as a % of income	7.8 %	1.7 %	1.3 %	0.1%	
46-55	in levels	-104	-448	-837	-1,952	
	as a % of income	9.2 %	-2.0 %	-2.6 %	-3.3 %	
E6 6E	in levels	-768	-1,379	-2,111	-4,043	
50-05	as a \setminus % of income	-12.0 %	-6.1 %	-6.5 %	-6.7 %	
:65	in levels	-1,309	-1,963	-2,612	-4,014	
205	as a % of income	-3.8 %	-10.4 %	-9.9 %	-9.6 %	

Conclusions and ongoing work

- New analytical framework to analyze the impact of unanticipated temporary inflation on households' wealth.
- ► Three channels: (i) Fisher; (ii) Nominal income; (iii) Relative consumption.
- Estimation for Spain in 2021:
 - Fisher and income much larger (in absolute values) than relative consumption
 - Middle-aged people largely unaffected (large debtors), old people (specially poor old people), mostly affected.
 - Results robust across datasets.
- Ongoing work:
 - Shock more persistent than expected: portfolio and consumption adjustment
 - dynamics in 2022

Conclusions

Thank you!

Additional slides

Inflation was quite heterogeneous across sectors •••••

Cuadro: Annual inflation and weights by ECOICOP group - December 2021

			_	
	(a) Inflation	Weights		
	INE BBVA	(b) INE (c) BBVA		
General	6.6 3.9			
1. Food and non-alcoholic beverages	4.9	22.8 15.6		
2. Alcoholic beverages and tobacco	1.6	3.1 5.3		
3. Clothing and footwear	0.7	6.3 7.2		
4. Housing and energy	22.9	13.2 5.5		
5. Furniture and household equipment	2.1	5.9 5.6		
6. Health	0.8	3.8 7.7		
7. Transport	10.7	12.9 15.6		
8. Communications	-0.3	3.6 2.7		
9. Recreation and culture	2.3	5.5 9.1		
10. Education	1.2	1.6 1.3		
11. Hotels, cafes and restaurants	4.0	13.1 10.1		
12. Others	1.6	8.1 14.2		

Values are in pp. Source: Spanish National Statistics Institute (INE, www.ine.es) and BBVA proprietary data. General inflation (a) is computed using the inflation rates for each COICOP group (common to INE and BBVA) and the spending weights (columns (b) and (c)).

Dispersion in individual inflation rates: BBVA

Figura: Individual annual inflation rates, Dec-2021: median for each age-income group in the BBVA clients' database

