

# The Heterogeneous Impact of Inflation on Households' Balance Sheets

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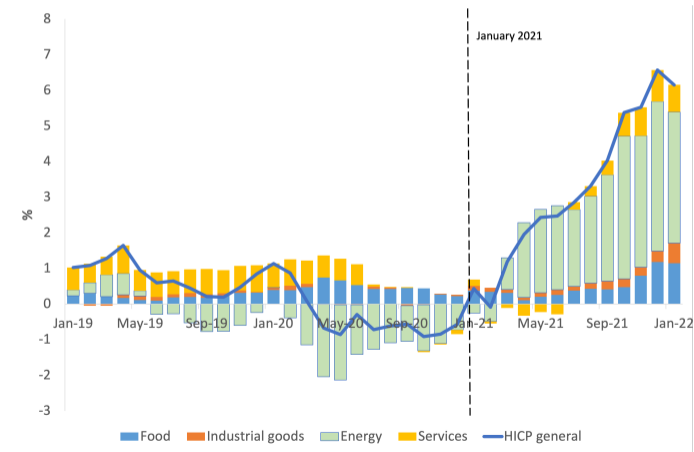
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# What are the costs of inflation born by households?

- | 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	
<b>Realized annual inflation</b>	<b>6.6</b>	<b>n.a.</b>	<b>6.6</b>	<b>n.a.</b>

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



## Nominal wealth dynamics for an individual is given by

$$\begin{aligned}
 P_{t+1}a_{j;t+1} = & m_{j;t} + 1 + \frac{\Delta Q_{t+1}}{Q_t} + i_t \quad Q_t d_{j;t} + 1 + \frac{\Delta q_{t+1}}{q_t} + r_{t+1}^s + {}_{t+1} P_t q_t s_{j;t} \\
 & - 1 + \frac{\Delta Q_{t+1}^b}{Q_t^b} + i_t^b \quad Q_t^b b_{j;t} + w_{j;t+1} - P_{t+1} C_{j;t+1}
 \end{aligned}$$

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,  $w_{j;t}$
- |  $P_{t+1} C_{j;t+1} = \prod_{k=1}^K p_{kt+1} c_{j;kt+1}$  is total consumption by the individual

## Nominal wealth dynamics for an individual is given by

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## A particular inflation shock

- | We consider the following experiment:

An **unexpected, one-off** price shock.

The shock is **temporary**

$$i_{t+1} > i^e; E_{t+1}[i_s] = i^e; \text{ for } s > t + 1;$$

where  $i^e$  is the expected constant inflation rate / 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  $t$ , **don't 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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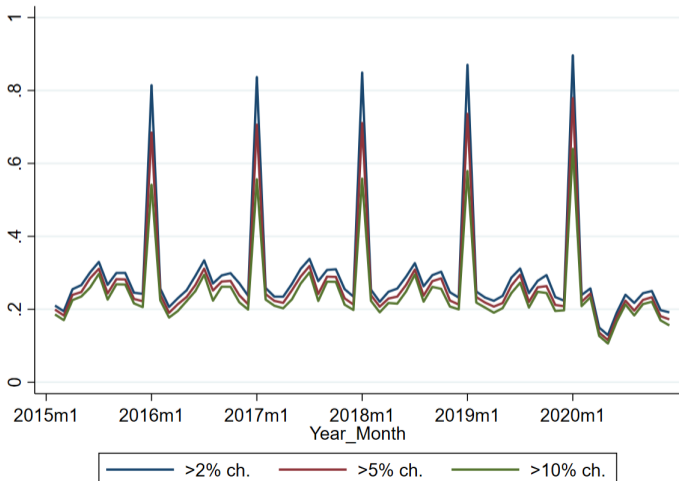
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# On the assumption of sticky wages

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



## Proposition 1: Impact of surprise inflation

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

$$da_{j;t+1} = \underbrace{\frac{1}{1+\pi_{j;t+1}} \frac{NNP_{j;t}}{W_{j;t+1}}}_{\text{Fisher channel}} - \underbrace{\frac{W_{j;t+1}}{W_{j;t+1}}}_{\text{Nominal income channel}} - \underbrace{C_{j;t+1} \frac{\pi_{j;t+1}}{1+\pi_{j;t+1}}}_{\text{Relative consumption channel}} - \underbrace{1}_{\text{Individual inflation}} \pi_{t+1}$$

where

$$NNP_{j;t} \equiv m_{j;t} + Q_t d_{j;t} - Q_t^b b_{j;t};$$

is net nominal position (NNP), and

$$C_{j;t+1} \equiv \sum_{k=1}^K C_{j;k;t+1} ; \quad \pi_{j;t+1} \equiv \sum_{k=1}^K \pi_{k;t+1} \pi_{j;k;t+1}$$

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.
  - | Its 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 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

- | 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**.

- | 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.

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where

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is net nominal position (NNP), and

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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

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

# Dispersion in individual in ation rates was relatively small...

▶ In ation rates by categories

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

... implying a much smaller relative consumption effect

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

Age group		Income group			
		<p25	p25-p50	p50-p75	>p75
<36	in levels	-267	-552	-661	-1,264
	as a % of income	-2.6 %	-2.9 %	-2.4 %	-2.9 %
36-45	in levels	-98	-59	-310	-997
	as a % of income	-0.9 %	-0.3 %	-1.0 %	-2.0 %
46-55	in levels	-395	-792	-1,268	-2,327
	as a % of income	-3.5 %	-3.5 %	-3.9 %	-4.4 %
56-65	in levels	-862	-1,295	-2,182	-3,650
	as a % of income	-8.3 %	-6.2 %	-6.9 %	-6.8 %
>65	in levels	-1,215	-1,553	-2,319	-4,115
	as a % of income	-12.7 %	-9.6 %	-9.8 %	-9.7 %



## Results using BBVA clients are qualitatively similar

Age group		Income group			
		ıp25	p25-p50	p50-p75	ıp75
ı36	Net nominal position	-5,133	-9,056	-10,863	-18,913
	Nominal (labour) income	7,530	15,744	22,183	37,929
	Relative consumption	-439	-135	-35	9
36-45	Net nominal position	-21,874	-29,618	-39,010	-48,051
	Nominal (labour) income	10,902	20,507	29,182	49,487
	Relative consumption	-335	30	-220	27
46-55	Net nominal position	-8,583	-10,702	-10,468	-6,280
	Nominal (labour) income	11,421	22,149	31,788	56,558
	Relative consumption	-149	161	345	252
56-65	Net nominal position	8,357	12,891	22,028	44,839
	Nominal (labour) income	11,593	22,616	32,325	59,370
	Relative consumption	-78	189	297	449
ı65	Net nominal position	23,179	32,283	41,381	61,539
	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

Age group		Income group			
		ip25	p25-p50	p50-p75	ip75
j36	in levels	-76	-253	-439	-735
	as a % of income	-24.0 %	-1.6 %	-2.0 %	-1.8 %
36-45	in levels	437	351	371	-56
	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 %
56-65	in levels	-768	-1,379	-2,111	-4,043
	as a % of income	-12.0 %	-6.1 %	-6.5 %	-6.7 %
i65	in levels	-1,309	-1,963	-2,612	-4,014
	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

Thank you!

Additional slides

# Inflation was quite heterogeneous across sectors ▶ Back

**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](http://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)).

