FISCAL POLICY DURING THE COST-OF-LIVING CRISIS

2026

BANCO DE ESPAÑA
Eurosistema

Documentos de Trabajo
N.º 2642

Myroslav Pidkuyko and Raffaele Rossi

FISCAL POLICY DURING THE COST-OF-LIVING CRISIS [*]

Myroslav Pidkuyko [**]

EUROPEAN COMMISSION, JOINT RESEARCH CENTRE

Raffaele Rossi [***]

UNIVERSITY OF BIRMINGHAM

(*) We thank Henrique Basso, Anindya Banerjee, Francesco Esposito, Clodomiro Ferreira, Galo Nuño, Vito Polito and the seminar participants from the Banco de España, the University of Birmingham and the University of Sheffield at the 7th JRC Fiscal Policy Modeling Workshop, 5th Sailing the MacroWorkshop, 50th SAEe, 14th Meeting of the ESCB Network on Microsimulation Modelling, and 1st Madrid Mountain Macro Conference.
(**) myroslav.pidkuyko@ec.europa.eu
(***) r.m.rossi@bham.ac.uk.

Documentos de Trabajo. N.º 2642

November 2026

https://doi.org/10.53479/44925

The Working Paper Series seeks to disseminate original research in economics and finance. All papers have been anonymously refereed. By publishing these papers, the Banco de España aims to contribute to economic analysis and, in particular, to knowledge of the Spanish economy and its international environment.

The opinions and analyses in the Working Paper Series are the responsibility of the authors and, therefore, do not necessarily coincide with those of the Banco de España or the Eurosystem.

The Banco de España disseminates its main reports and most of its publications via the Internet at the following website: http://www.bde.es.

Reproduction for educational and non-commercial purposes is permitted provided that the source is acknowledged.

© BANCO DE ESPAÑA, Madrid, 2026

ISSN: 1579-8666 (online edition)

Abstract

We study the effects of fiscal support on household welfare during the 2021-23 inflation surge. We compare two common policy responses: temporary VAT cuts on food and energy, and expansions of means-tested transfers. Using a quantitative heterogeneous-household model of saving, expenditure composition, and labour supply, we find that VAT cuts generate meaningful welfare gains, but these gains accrue mainly to pensioners and higher-wealth households. A revenue-neutral expansion of means-tested transfers delivers about twice the aggregate welfare gains and spreads them more evenly across households. More broadly, the paper shows that the form of fiscal relief is central to its aggregate and distributional effects during inflation surges.

Keywords: cost-of-living crisis, life-cycle models, fiscal policy.

JEL classification: E21, E44.

Resumen

En este documento se estudian los efectos sobre el bienestar de los hogares de las medidas fiscales de apoyo adoptadas durante el repunte de la inflación de 2021-2023. Comparamos dos respuestas habituales de política económica: las rebajas temporales del IVA de los alimentos y la energía, y la ampliación de las transferencias condicionadas al nivel de renta. Utilizando un modelo cuantitativo con hogares heterogéneos que incorpora decisiones de ahorro, composición del gasto y oferta laboral, encontramos que las rebajas del IVA generan ganancias de bienestar significativas, si bien estas se concentran principalmente entre los pensionistas y los hogares con mayor riqueza. Una ampliación de las transferencias condicionadas al nivel de renta, neutral en términos recaudatorios, genera aproximadamente el doble de ganancias agregadas de bienestar y las distribuye de forma más equilibrada entre los hogares. En términos más generales, el documento muestra que el diseño de las medidas fiscales de alivio resulta clave para sus efectos agregados y distribucionales durante los episodios de repunte de la inflación.

Palabras clave: crisis del coste de la vida, modelos de ciclo vital, política fiscal.

Códigos JEL: E21, E44.

1 Introduction

This paper studies the household-side aggregate and distributional effects of fiscal responses to the 2021–2023 inflation surge. We focus on two policy instruments widely used during the episode: temporary VAT reductions on selected goods and temporary expansion of targeted income support. We analyze these interventions in a quantitative life-cycle model with incomplete markets, household heterogeneity, and endogenous savings, expenditure composition, and employment choice (Parodi, 2023; De Nardi et al., 2024), disciplined using household microdata from Spain.

The policy question is motivated by the unusual nature of the recent inflation episode and the concrete risk of similar future ones. The surge that began in 2021 was historically large, persistent, and disproportionately concentrated in essential goods, especially food and energy. As a result, the shock was not only severe in the aggregate, but also uneven across households. Because lower-income households devote larger expenditure shares to necessities, they faced higher effective inflation rates than richer households. At the same time, the erosion of purchasing power interacted with balance-sheet positions, labor income, and the tax-transfer system, creating a broader set of welfare effects than those captured by differences in expenditure baskets alone. These features are what turned the episode into a *cost-of-living* crisis and made the design of fiscal responses especially consequential.

In this respect, Spain provides a natural setting for our analysis. As a small open economy within a monetary union, it faces an externally determined nominal interest rate, while much of the recent inflation surge was largely imported rather than internally determined. These features make it well suited to studying how a common inflationary disturbance transmits through household heterogeneity and allow us to isolate more cleanly how alternative fiscal responses shape welfare incidence, without taking a stand on the determination of inflation itself.

Our analysis proceeds in two steps. We first quantify the welfare cost of the inflation surge absent any discretionary fiscal intervention. In the *laissez-faire* benchmark, the aggregate welfare loss is large—about 6.65% in consumption-equivalent variation (CEV)—and reflects the joint contribution of four channels: relative-price distortions from necessity inflation (Olivi et al., 2026), real-income erosion from sluggish nominal adjustment, Fisher redistribution across nominal asset positions (Doepke and Schneider, 2006), and fiscal drag from bracket creep and incomplete indexation (García-Miralles et al., 2026). All four channels matter quantitatively and generate substantial heterogeneity across demographic groups, income levels, and nominal

asset positions.

We then conduct our main policy exercise and compare two fiscal responses. The first replicates the temporary VAT cuts on food and energy implemented in Spain in 2022 and 2023. The second considers a revenue-equivalent temporary expansion of targeted income support. The two policies represent distinct ways of cushioning a cost-of-living shock: VAT cuts operate through consumer prices, especially necessities, whereas transfers support disposable income directly. Quantitatively, VAT cuts reduce welfare losses by about 0.24 percentage points in CEV terms, with gains concentrated among pensioners and asset-rich households. The transfer expansion reduces welfare losses by about 0.48 percentage points—roughly twice as much—and distributes gains more evenly, especially toward borrowers, lower-income households, and working-age groups.

The intuition for these results is the following. Although necessity-price inflation is an important part of the episode, the benchmark welfare losses are driven mainly by broader nominal channels, especially the erosion of real disposable income, Fisher redistribution across nominal asset positions, and fiscal drag. VAT cuts mitigate the relative-price component of the shock, but do little to support the cash flow of households with limited self-insurance. By contrast, targeted income support reaches those households more directly by stabilizing disposable resources, and therefore provides broader household insurance against the inflation surge. More generally, the comparison shows that, in cost-of-living episodes like this one, the welfare effects of fiscal intervention depend not only on its fiscal cost, but also on its design. In our setting, targeted income support is better matched than broad consumption-tax relief to the household-side margins through which external price pressures generate welfare losses. This policy ranking is consistent with microsimulation results in Amores et al. (2025), who show that income-side measures were more cost-effective than price measures in closing distributional welfare gaps during the 2022 euro-area inflation episode. Our framework provides a structural interpretation of this result.

The paper mainly relates to two strands of literature.

First, it contributes to the literature on the distributional consequences of inflation in heterogeneous-agent economies. A central insight of this work is that inflation redistributes across households because agents differ in nominal balance-sheet positions, income sources, exposure to nominal contracts, and expenditure composition (Doepke and Schneider, 2006; Auclert, 2019; Kaplan et al., 2018; Auclert et al., 2021; Pallotti et al., 2024; Olivi et al., 2026). Our contribution is to study the 2021–2023 inflation surge in a life-cycle model with endogenous savings, expenditure composi-

tion, and labor supply, featuring incomplete markets and non-homothetic demand. This moves the analysis beyond a pure accounting exercise of inflation costs by allowing households to adjust along multiple endogenous margins in response to the shock. At the same time, the framework also incorporates rich heterogeneity by productivity, age, gender, education, family composition and fertility. Capturing this degree of heterogeneity in a full general-equilibrium environment, particularly while also considering the full transition of the inflation surge, would be considerably less tractable and make the analysis less clear. By focusing on household behaviour, our approach keeps instead the trasmission mechanism transparent while preserving the key margins needed to quantify the welfare incidence of fiscal policy over the observed inflationary transition.

Second, the paper relates to quantitative work on fiscal insurance and tax-transfer design in incomplete-markets economies (Imrohoroğlu, 1989; Huggett, 1993; Guner et al., 2020; Parodi, 2023; De Nardi et al., 2024; Macnamara et al., 2026). This literature studies how taxes, transfers, and social insurance provide consumption smoothing and redistribution when households face idiosyncratic risk and limited self-insurance. Our contribution to this strand is to study fiscal insurance in the context of an observed inflationary transition and to compare two policy instruments that were central in the recent policy debate: temporary VAT relief and targeted transfer expansion. The comparison is revenue-neutral, which lets us show not only whether fiscal intervention insures households against inflation, but also which instrument is better matched to the household margins through which the inflation surge operates.

The rest of the paper is organized as follows. Section 2 introduces the model, Section 3 describes the estimation exercise, Section 4 describes the main policy experiments, finally Section 5 concludes.

2 Model

2.1 General Setting and Demographics

We develop a discrete-time, partial-equilibrium, life-cycle model with incomplete markets in the tradition of Bewley (1977) (see also Parodi, 2023; De Nardi et al., 2024). Individuals enter economic life at age 25, derive utility from consumption, leisure, and bequests (upon dying), and save or borrow through a risk-free nominal asset subject to an exogenous borrowing limit. Markets are incomplete because agents face uninsurable idiosyncratic earnings risk and borrowing constraints may be binding.

Households differ by gender, age, marital status, number of children, education, labor productivity, and assets. Gender (male and female), marital status (couple and single), and education (primary, secondary and tertiary) are fixed at entry, while fertility evolves stochastically.[1] Men always work full time, while women choose labor supply on the extensive margin. Single individuals choose consumption and savings, and single women also choose labor supply. Couples make joint consumption–saving decisions and choose the married woman's labor supply. Individuals retire at age $W + 1$, face gender-specific survival risk thereafter, and die with certainty in period J.

2.2 Preferences

We exploit the two-stage budgeting result of Gorman (1959). Conditional on total real consumption expenditure c_t and the vector of tax-inclusive consumer prices relative to the aggregate consumption price index P_t,

$$\tilde{P}_t = [\tilde{P}_{f,t}, \tilde{P}_{e,t}, \tilde{P}_{s,t}, \tilde{P}_{r,t}, \tilde{P}_{g,t}],$$

the intratemporal allocation across goods is summarized by the indirect utility function $v(\tilde{P}_t, c_t)$.[2] Households consume five categories of non-durable goods, aligned with the Spanish VAT system: food (f), energy (e), super-reduced goods (s), reduced goods (r), and general goods (g).[3] Conditional on c_t, households solve

$$\begin{aligned} &\max_{c_{f,t}, c_{e,t}, c_{s,t}, c_{r,t}, c_{g,t}} \tilde{u}(c_{f,t}, c_{e,t}, c_{s,t}, c_{r,t}, c_{g,t}) \\ &\text{s.t.} \quad \tilde{P}_{f,t}c_{f,t} + \tilde{P}_{e,t}c_{e,t} + \tilde{P}_{s,t}c_{s,t} + \tilde{P}_{r,t}c_{r,t} + \tilde{P}_{g,t}c_{g,t} = c_t, \end{aligned} \tag{1}$$

where

$$\tilde{P}_{k,t} = \frac{(1 + \tau_{k,t})\, p_{k,t}}{P_t}, \qquad k \in \{f, e, s, r, g\}.$$

We model $v(\tilde{P}_t, c_t)$ as a Quadratic Almost Ideal Demand System (QUAIDS) indi-

[1] As for education, *primary* means no-high school, *secondary* identifies high-school level and/or some college, and *tertiary* means college and beyond.

[2] The indirect utility representation is invariant to monotonic transformations of the underlying utility function.

[3] We exclude durable goods because the policy variation studied in the paper concerns temporary VAT reductions on food and energy, rather than broad-based tax cuts on durable consumption. This keeps the demand system aligned with the consumption categories directly affected by the Spanish cost-of-living measures. Incorporating durables would require modelling stocks, depreciation, and lumpy adjustment, substantially increasing the state space.

rect utility function (Deaton and Muellbauer, 1980; Banks et al., 1997):

$$v(\tilde{P}_t, c_t) = \exp\left\{\left[\left(\frac{\ln c_t - \ln a(\tilde{P}_t)}{b(\tilde{P}_t)}\right)^{-1} + \lambda(\tilde{P}_t)\right]^{-1}\right\}, \tag{2}$$

with the price index functions defined as,

$$\ln a(\tilde{P}_t) = \alpha_0 + \sum_{i\in\mathcal{G}} \alpha_i \ln \tilde{P}_{i,t} + \frac{1}{2}\sum_{i\in\mathcal{G}}\sum_{j\in\mathcal{G}} \gamma_{ij} \ln \tilde{P}_{i,t} \ln \tilde{P}_{j,t}, \tag{3}$$

$$b(\tilde{P}_t) = \prod_{i\in\mathcal{G}} \tilde{P}_{i,t}^{\beta_i}, \tag{4}$$

$$\lambda(\tilde{P}_t) = \sum_{i\in\mathcal{G}} \lambda_i \ln \tilde{P}_{i,t}. \tag{5}$$

In the QUAIDS specification, the functions $a(\tilde{P}_t)$, $b(\tilde{P}_t)$, and $\lambda(\tilde{P}_t)$ summarize how the vector of relative consumer prices enters indirect utility. The term $a(\tilde{P}_t)$ is a translog price index, where α_0 is a constant, α_i are first-order price coefficients, and γ_{ij} capture second-order interactions across goods. The term $b(\tilde{P}_t)$ is a Cobb–Douglas price aggregator, with coefficients β_i governing how each price scales real expenditure. Finally, $\lambda(\tilde{P}_t)$ is the quadratic price term specific to QUAIDS, with coefficients λ_i controlling the degree of non-homotheticity in demand. Here, $\mathcal{G} = \{f, e, s, r, g\}$ denotes the set of consumption categories and $\tilde{P}_{i,t}$ is the tax-inclusive price of good i relative to the aggregate consumption price index.

At the intertemporal stage, utility is a weakly separable function of the indirect utility generated by equivalized consumption and leisure (ℓ):

$$u(v(\tilde{P}_t, c_t), \ell_t) = \frac{\left[v\left(\tilde{P}_t, \frac{c_t}{\mu_t}\right)\ell_t\right]^{1-\sigma}}{1-\sigma}, \tag{6}$$

where σ controls relative risk aversion and μ_t is the household equivalence scale, equal to 1 for the first adult, 0.5 for each additional adult, and 0.3 for each child.

For men, leisure equals $\ell_t = 1 - \bar{h}$ when working and $\ell_t = 1$ in retirement. For women,

$$\ell_t = 1 - h_t - \mathbf{1}_{h_t>0}\Psi(e, t, s),$$

with

$$\Psi(e, t, s) = \frac{\exp(\psi_0^{e,s} + \psi_1^{e,s} t + \psi_2^{e,s} t^2)}{1 + \exp(\psi_0^{e,s} + \psi_1^{e,s} t + \psi_2^{e,s} t^2)}, \tag{7}$$

where $\Psi(e,t,s)$ captures a fixed time cost of working depending on education e, age t, and marital status (s), e.g., De Nardi et al. (2024). Moreover, following De Nardi (2004) and Benhabib et al. (2019), agents also derive utility from bequests (upon dying), i.e.,

$$\phi(a) = \phi_1 \frac{(a+\phi_2)^{1-\sigma}}{1-\sigma}, \tag{8}$$

where ϕ_1 governs the strength of the bequest motive and ϕ_2 captures the luxury nature of bequests. Finally, we postulate that the utility of a couple equals the sum of individual utilities.

2.3 Labor Income, Assets, and Fiscal Policy

Labor Income. Only women choose whether to work, with labor supply on the extensive margin $h \in \{0, \bar{h}\}$, while men always work full time. We model log earnings conditional on working. For an individual with education level e at age t, earnings are given by

$$\ln y_t^e = f^e(t) + z_t^e, \qquad z_t^e = \rho^e z_{t-1}^e + v_t^e.$$

Here, y_t^e denotes earnings conditional on employment, $f^e(t)$ is the deterministic life-cycle component and z_t^e is an idiosyncratic persistent shock. We approximate the deterministic component by a flexible polynomial in age, estimated separately by gender and education, so as to capture the observed hump-shaped earnings profile over the life cycle. The stochastic component follows an AR(1) process, where ρ^e governs persistence and v_t^e is an innovation distributed as

$$v_0^e \sim \mathcal{N}(0, \sigma_{0,v}^e), \qquad v_t^e \sim \mathcal{N}(0, \sigma_v^e).$$

Thus, $\sigma_{0,v}^e$ captures heterogeneity in earnings at labor-market entry, while σ_v^e measures the dispersion of subsequent shocks. For women, realized labor income equals y_t^e if employed and zero otherwise.

Assets. There is a single nominal asset a yielding the risk-free return R. Households may borrow up to the exogenous limit $\underline{a}$.

Fiscal Policy. Households solve their problem in real terms, but the tax-and-transfer system is defined on nominal income, as in the institutional data. Calling real labor

and capital incomes as y_l and y_k, their nominal counterparts are

$$Y_l = P_t y_l, \qquad Y_k = P_t y_k, \qquad Y = Y_l + Y_k.$$

Taxes and transfers are assessed on these nominal variables, while the household budget constraint is written in real terms. Therefore, nominal tax liabilities and transfers enter the problem after being deflated by the general price index P_t, that is, as $\mathcal{T}(\cdot)/P_t$. This distinction is important because inflation affects disposable resources through two channels. First, it changes the real value of nominal taxes and transfers through the price level. Second, when tax brackets and benefit thresholds are not fully indexed, inflation changes households' effective tax burdens and transfer entitlements even if real income is unchanged. In this way, inflation generates fiscal drag in addition to its direct effect through consumer prices.

Government revenues come from progressive labor and capital income taxes, social-security contributions, and category-specific VAT rates. Labor income taxes follow from a standard truncated two-parameter tax function as in Heathcote et al. (2014) (see also García-Miralles et al., 2019 for an application to Spain):

$$\mathcal{T}_l(Y_l) = \begin{cases} 0 & \text{if } Y_l < \tilde{Y}_l \\ \left[1 - \lambda_l \left(\frac{Y_l}{\bar{Y}_l}\right)^{-\tau_l}\right] Y_l & \text{otherwise,} \end{cases} \tag{9}$$

where τ_l captures the progressivity of the income tax schedule, λ_l the average level of income taxes, $\bar{Y}_l$ is the mean nominal labor income level, and $\tilde{Y}_l$ is the nominal labor income level below which the labor tax is zero.

Similarly, the capital income tax, $\mathcal{T}_k(\cdot)$, can be approximated for Spain (see García-Miralles et al., 2019) as:

$$\mathcal{T}_k(Y_k) = \begin{cases} \left(\alpha_k + \zeta_k \frac{Y_k}{\bar{Y}_k}\right) Y_k & \text{if } Y_k < \tilde{Y}_k \\ \kappa_k Y_k & \text{otherwise} \end{cases} \tag{10}$$

where α_k, ζ_k, and κ_k are capital income tax parameters, $\bar{Y}_k$ is the mean nominal capital income level, and $\tilde{Y}_k$ is the capital income level beyond which capital income tax is flat at rate κ_k.

The government provides two types of benefits to individuals — tax credits and means-tested transfers. We model tax credits $\mathcal{T}_c(\cdot)$ as in Carrillo and Ramos (2024)

who provide a comprehensive estimation of Spain's tax credit system:

$$\mathcal{T}_{cred}(Y) = \left[\beta_0^c + \beta_1^c \exp\left(\frac{Y}{\bar{Y}}\right)^{\gamma_c}\right] Y, \tag{11}$$

where Y is nominal total income and $\bar{Y}$ is the average nominal income.

Means-tested transfers $T_m(\cdot)$ capture the existing targeted cash-support system faced by Spanish households in the pre-crisis environment. To preserve tractability, we approximate this schedule with a parsimonious reduced-form rule of the type commonly used in the quantitative public-finance literature, e.g., Guner et al. (2024). The rule is intended to match the level and income incidence of targeted cash support in Spain, rather than to reproduce the institutional details of any single program one-for-one:

$$\mathcal{T}_m(Y) = \begin{cases} g_0\, \bar{Y} & \text{if } Y = 0 \\ \max\{0, g_1\, \bar{Y} + g_2\, Y\} & \text{otherwise} \end{cases} \tag{12}$$

Individuals also pay a proportional social security tax rate τ_{ss} and receive old-age pension benefits that are proportional to their last-period nominal income.

As such, the per-period government budget constraint is given by

$$G_t + \mathbb{T}_{m,t} + \mathbb{T}_{cred,t} + \mathbb{T}_{pen,t} = \mathbb{T}_{l,t} + \mathbb{T}_{k,t} + \mathbb{T}_{ss,t} + \sum_{j \in \mathcal{G}} \tau_j \mathbb{C}_{j,t}, \tag{13}$$

where terms on the left side is the government expenditure, given by the sum of exogenous governmental spending (G_t), spending on mean-tested transfers $\mathbb{T}_{m,t}$, spending on tax credits $\mathbb{T}_{cred,t}$, and spending on pensions $\mathbb{T}_{pen,t}$, respectively. The terms on the right side are instead governmental revenues, given by revenues from the labor income tax $\mathbb{T}_{l,t}$, capital income tax $\mathbb{T}_{k,t}$, social security contributions $\mathbb{T}_{ss,t}$, and VAT revenues from each of five expenditure categories $\sum_{j=f,e,s,r,g} \tau_j \mathbb{C}_{j,t}$. All velues are given in nominal terms. Above, the generic function in bold math repreents the aggregate equivalent, e.g., $\mathbb{T}_{m,t}$ is the aggregate function of the means-tested transfers $\mathcal{T}_m(\cdot)$. As such, functions in (13) are constructed as

$$\mathbb{X}_t = \sum_{i \in \{m,f,c\}} pr_i \sum_{j=1}^{J} \mu_j \int x_t d\psi_j^i \tag{14}$$

where pr_i is the share of the corresponding demographic group (single males, single females, and couples), μ_j is the distribution of individuals across age groups, and ψ_j^i

is the distribution of agents within each age group and demographic type.

2.4 Budget Constraint and Inflation Channels

For a working-age household, the nominal budget constraint is

$$P_t a_{t+1} + P_t c_t = (1 + R_t) P_{t-1} a_t + Y_{l,t} - \mathcal{T}_l(Y_{l,t}) - \mathcal{T}_k(R_t P_{t-1} a_t) + \mathcal{T}_c(Y_t) + \mathcal{T}_m(Y_t) - \tau_{ss} Y_{l,t}, \tag{15}$$

where total nominal income is $Y_t = Y_{l,t} + R_t P_{t-1} a_t$.[4] Letting $\Pi_t = P_t / P_{t-1}$, the real budget constraint is

$$a_{t+1} + c_t = (1 + R_t)\Pi_t^{-1} a_t + \frac{Y_{l,t} - \mathcal{T}_l(Y_{l,t}) + \mathcal{T}_c(Y_t) + \mathcal{T}_m(Y_t) - \tau_{ss} Y_{l,t}}{P_t} - \frac{\mathcal{T}_k(R_t P_{t-1} a_t)}{P_t}, \tag{16}$$

with total real consumption expenditure defined in (1).[5]

2.5 Effects of Unexpected Inflation

Consider the economy in its steady state, where, without loss of generality, $P_1 = 1$. Suppose that in period 2 an unexpected inflation shock occurs such that the price level follows a deterministic sequence $\{P_t\}_{t \geq 2}$ with $P_2 > 1$. The entire path of prices is unexpected at $t = 1$ but perfectly foreseen thereafter. Inspecting the real household budget constraint in (16) together with the consumption aggregator in (1), inflation affects household welfare through four distinct channels. These channels correspond to the transmission mechanisms that we isolate in the quantitative decomposition presented in details in Section 4.

Real income channel If nominal wages grow more slowly than the price level,

$$\frac{Y_{l,2}}{Y_{l,1}} < \Pi_2,$$

then real labor income declines:

[4] Note that nominal capital income in period t is the nominal return on beginning-of-period assets,

$$Y_{k,t} = R_t P_{t-1} a_t,$$

so that real capital income is

$$y_{k,t} = \frac{Y_{k,t}}{P_t} = R_t \Pi_t^{-1} a_t.$$

[5] A full charcaterisation of the model in recursive form can be found in Appendix A.1.

$$\frac{y_{l,2}}{y_{l,1}} = \frac{Y_{l,2}/P_2}{Y_{l,1}/P_1} = \frac{Y_{l,2}}{\Pi_2 Y_{l,1}} < 1.$$

Inflation therefore erodes purchasing power whenever nominal income adjustments lag behind price increases.

Fiscal drag Because taxes and transfers are defined on nominal income, inflation mechanically alters disposable income even if real earnings remain unchanged. In particular, higher nominal income pushes households into higher statutory tax brackets and erodes eligibility thresholds for transfers. As a result, real disposable income falls through bracket creep and benefit erosion.

Relative price channel Inflation episodes typically involve heterogeneous price changes across consumption categories. Because total real consumption expenditure satisfies

$$c_t = \sum_{j \in \mathcal{G}} \tilde{P}_{j,t} c_{j,t},$$

changes in relative prices modify the real cost of a given consumption bundle proportionally to expenditure shares. Since preferences are non-homothetic, these shares vary systematically across households. Relative price movements therefore generate heterogeneous effective inflation rates and welfare losses across individuals.

Asset revaluation (Fisher channel) Unexpected inflation also changes the real value of nominal asset positions. In the absence of inflation the real payoff from assets in period 2 would be $(1 + R)a_1$, while with inflation it becomes

$$(1 + R)\Pi_2^{-1} a_1.$$

The unexpected revaluation is therefore

$$\Delta = (1 + R)(\Pi_2^{-1} - 1)a_1.$$

Since $\Pi_2^{-1} < 1$, inflation redistributes wealth from savers to borrowers.

3 Empirical discipline and quantitative mapping to the four costs of inflation

Section 2.5 showed that the welfare consequences of an inflation surge operate through four channels: real-income erosion, fiscal drag, relative-price distortions, and Fisher redistribution. This section explains how the quantitative strategy disciplines each of them. The objective is not to fit generic life-cycle moments in isolation, but to pin down the household margins through which the observed inflation episode maps into welfare.

This is crucial for the interpretation of our results. In Section 4, we feed the model with the realized paths of category prices and nominal incomes and solve for households' endogenous responses in consumption, expenditure composition, savings, and female labor supply. The model is therefore used as a disciplined household-side welfare-accounting device for the observed inflation episode, rather than as a model of equilibrium inflation determination. Thus, the credibility of that exercise relies on whether the model captures the relevant exposure margins: expenditure heterogeneity, nominal income dynamics, labor-supply adjustment, the shape of taxes and transfers in nominal space, and nominal net asset positions over the life cycle.

From a technical point of view, we follow the standard approach in structural micro- and macro-econometrics, e.g. Gourinchas and Parker (2002), and discipline the model in two steps. A first group of parameters is set externally using direct observation, previous estimates, or direct estimation procedures. The remaining parameters are calibrated internally by Simulated Method of Moments (SMM) to match key Spanish moments on expenditure, income, assets, and labor supply.[6]

3.1 The Data

Our quantitative analysis uses three Spanish household surveys. First, the Spanish Household Budget Survey (*Encuesta de Presupuestos Familiares*) provides detailed expenditure data and demographics, which we use to estimate the demand system and discipline expenditure shares across households. After excluding durables, private education, and categories without reliable price data, we aggregate expenditure into the five consumption groups used in the model and merge these data with category-level price indices from the National Statistics Institute. We use the annual waves

[6] A brief explanation of the numerical method used can be found in Appendix A.2.

2006–2023.

Second, the Spanish Living Conditions Survey (*Encuesta de Condiciones de Vida*) provides information on household income, labor supply, and demographics. We use the 2008–2024 waves to discipline the earnings process and female labor-force participation.

Third, the Spanish Survey of Household Finances (*Encuesta Financiera de las Familias*) provides detailed information on household balance sheets, income sources, and demographics. We use all available waves between 2002 and 2024 to discipline nominal net positions over the life cycle.

3.2 Externally Set Parameters

3.2.1 Estimating the Demand System

We model the intratemporal allocation of expenditure using a QUAIDS, following Banks et al. (1997). This specification allows for non-homothetic Engel curves and is therefore well suited to capturing the heterogeneous welfare effects of changes in relative prices and indirect taxes. For each good $i, j \in \{f, e, s, r, g\}$, we estimate

$$w_{i,t} = \alpha_i + \sum_{j \in \mathcal{G}} \gamma_{ij} \ln \tilde{P}_{j,t} + \beta_i \ln\left(\frac{c_t}{a(\tilde{P}_t)}\right) + \frac{\lambda_i}{b(\tilde{P}_t)} \left[\ln\left(\frac{c_t}{a(\tilde{P}_t)}\right)\right]^2 + e_{i,t}, \qquad (17)$$

where $a(\tilde{P}_t)$ and $b(\tilde{P}_t)$ are defined in Section 2.2, and $e_{i,t}$ is a measurement error term. Total expenditure, c_t, in (17) is likely to be endogenous, because it may be correlated with the error term in the budget-share equation. The source of the problem is mechanical: the dependent variable is itself constructed using total expenditure in the denominator, which induces a correlation between measured expenditure shares and the residual. To address this issue, we use a grouping-estimator strategy, e.g., Parodi (2023). Specifically, we group households by demographics—year, region of residence, and the age of the household head—and use the resulting group-level variation to identify total expenditure. The identifying assumption is that group membership affects expenditure shares only indirectly, through its effect on total expenditure, rather than directly through preferences or unobserved demand shocks.

Table 1 shows that the QUAIDS specification delivers sensible Engel curvature and substitution patterns. First of all, food and energy have budget elasticities well below one, while broader non-essential aggregates have elasticities above one, confirming the necessity–luxury ranking that is central for the incidence of the infla-

Table 1: Demand System Results

Panel A: Demand System Estimates

	Super-reduced	Reduced	General	Food	Energy
α_i	0.129***	0.221***	0.320***	0.221***	0.107***
β_i	−0.025***	0.085***	0.073***	−0.093***	−0.041***
λ_i	0.000	0.003***	0.000	−0.006***	0.003
γ_{if}	−0.101***	−0.008	−0.193***	−0.011	0.074***
γ_{ie}	0.076***	0.026***	−0.083***	−0.073***	0.055***
γ_{is}	0.056***	0.056***	−0.088***	−0.101***	−0.076***
γ_{ir}	0.056**	0.129***	−0.203***	−0.008	0.026*
γ_{ig}	−0.088***	−0.203***	0.181***	0.193***	−0.083***

Panel B: Predicted Shares and Elasticities

	Super-reduced	Reduced	General	Food	Energy
Shares	0.116***	0.220***	0.344***	0.227***	0.094***
Budget Elasticity	0.788***	1.391***	1.212***	0.586***	0.567***
Marshallian Elasticity	−0.496***	−0.494***	−0.546***	−0.951***	−0.374***
Hicksian Elasticity	−0.404***	−0.188	−0.129***	−0.818***	−0.321***

Panel C: Non-Homothetic Terms

	Estimate
$\ln(a(\tilde{P}))$	0.478***
$b(\tilde{P})$	1.009***
$\lambda(\tilde{P})$	0.000***

Note: Author's own calculations based on the Spanish Household Budget Survey, 2006–2019. *, **, *** denote 10%, 5%, and 1% significance levels.

tion surge. Second, own-price elasticities are negative throughout, and compensated elasticities are smaller in absolute value than Marshallian elasticities, as implied by theory. These estimates are important as they provide the key empirical discipline for the relative-price channel of the cost-of-living crisis.

3.2.2 Earnings and Wages

We calibrate the deterministic and stochastic components of earnings using the Spanish Living Conditions Survey, separately by gender and education. We construct earnings as the sum of regular gross labor earnings and in-kind payments across all jobs, and define wages as earnings divided by weekly hours worked, normalized to model units.

The calibration proceeds in two stages. First, we recover the deterministic component by regressing log earnings on a flexible polynomial in age, separately by gender and education. This yields the coefficients $a_0, \ldots, a_4$ that govern the life-cycle profile of log earnings in the model, see Table 2. We obtain standard inverted U-shaped earning profiles, increasing in education, whereas for each education level, women have lower earning life-cycle profiles. For the sake of brevity, the deterministic life cycle profile by gender and education are reported in Figure B.2 in Appendix B. Second, we calibrate the stochastic component from the residual process, assuming that idiosyncratic earnings follow a persistent AR(1) process. The parameters of this process—the persistence ρ, the innovation standard deviation σ_v, and the dispersion of initial conditions $\sigma_{0,v}$—are calibrated by GMM, matching a set of cross-sectional dispersion moments of residual earnings by gender, education, and age group. Specifically, we target the p90/p10 and p75/p25 ratios for ages 25–34 and 40–49. These fit moments are reported in Table B.1 in Appendix B.

The results in Table 2 show that stochastic component displays substantial persistence across all groups, with calibrated AR(1) coefficients ranging from 0.72 to 0.90, implying that earnings shocks are fairly long-lived over the life cycle. At the same time, the variance of innovations and initial conditions is far from uniform: earnings risk is generally larger for lower-educated workers and for women, especially at the start of working life, pointing to stronger heterogeneity in labor-income uncertainty across demographic groups.

These results are important for the inflation exercise because they discipline the main labor-income margins through which inflation affects welfare. They pin down how real labor income changes when nominal wage growth lags behind prices, how much households can offset this through female labor-supply adjustment, and how

Table 2: Calibrated Earnings Parameters by Gender and Education Level

	Males			Females		
Parameter	**Primary**	**Secondary**	**Tertiary**	**Primary**	**Secondary**	**Tertiary**
a_0	-0.16	0.06	-0.20	-0.69	-0.63	-0.20
a_1	0.07	0.09	0.18	0.07	0.11	0.13
a_2	-0.005	-0.007	-0.011	-0.006	-0.008	-0.010
a_3	1.6e-05	2.4e-05	3.4e-05	2.3e-05	2.9e-05	4.1e-05
a_4	-2.29e-06	-3.36e-06	-4.17e-06	-2.97e-06	-3.68e-06	-5.75e-06
Persistence (ρ)	0.723	0.859	0.769	0.903	0.721	0.720
Shock Std. Dev. (σ_v)	0.626	0.429	0.428	0.432	0.622	0.590
Init. Std. Dev. ($\sigma_{0,v}$)	0.445	0.407	0.404	0.634	0.544	0.415

Note: Author's own calculations based on the Spanish Living Conditions Survey, 2008–2019.

fiscal drag falls across households when taxes and transfers are defined on nominal income. They also help discipline savings behavior and thus exposure to the Fisher redistribution channel. Additional fit moments and visual validation are reported in Table B.3 in Appendix B.

3.2.3 Children

In the model, children arrive stochastically, with transition probabilities varying by household type and age. We calibrate these transitions to match the observed age profile of the number of children for single women and couples in the data. For brevity, the technical details about the estimation of fertility and how the model performs are reported in Figure B.1 of Appendix B. Matching family composition is important because equivalence scales affect how a given inflation shock maps into welfare.

3.2.4 Other Externally Set Parameters

The remaining exogenous parameters are set using institutional information and previous estimates. We set the risk-aversion coefficient σ equal to 2, a value commonly used in the literature. Also, we set the nominal interest rate to 2%, close to the average ECB rate during the cost-of-living crisis. Consumption tax rates are set to match the Spanish VAT schedule in 2019, with pre-crisis rates on food and energy. The labor income tax, capital income tax, and tax-credit schedules are taken directly from Carrillo and Ramos (2024), while the means-tested transfer rule follows Guner

et al. (2020). Both these papers estimate those tax and transfer function on Spanish microdata. In all cases we complement this parametrisation with the average income component over the sample period taken from the Spanish Living Consitions Survey. Finally, social-security contributions and pension replacement rates are set to match the Spanish to replicate average pension income to labor income by education and gender type.

We use data from the Spanish National Statistics Institute to calculate survival probabilities and the implied age distribution $\{\mu_j\}_{j=1}^{J}$. Education shares are calibrated from the Spanish Living Conditions Survey. Finally, we set the borrowing, $\underline{a}$ equal to three times average income, consistent with observed mortgage debt-to-income ratios in the Survey of Household Finances.[7] For the sake of brevity, the full list of exogenous parameters is reported in Table B.2 of Appendix B.

3.3 Internally Set Parameters: the Simulated Method of Moments

We calibrate the remaining preference parameters by Simulated Method of Moments (SMM), choosing the parameter vector so that model-generated moments are as close as possible to their empirical counterparts. The parameters calibrated in this step are the discount factor β, the bequest parameters ϕ_1 and ϕ_2, and the parameters governing the fixed time cost of market work for women, as described in equation (7). The discount factor and bequest parameters are allowed to vary by education, while the female work-cost parameters vary by education and marital status. For any candidate parameter vector, we solve the model, simulate the stationary distribution, compute the same moments as in the data, and minimize a quadratic distance between simulated and empirical moments.

The SMM targets are chosen to match the model margins governed by these parameters. In total, the estimation uses 137 moments, combining: (i) the life-cycle profile of consumption, (ii) the ratio of nominal net position to income by education at ages 35 and 65, and (iii) female labor-force participation profiles by education and marital status.

The first two sets of moments (consumption profiles and nominal net positions) identify β, ϕ_1, and ϕ_2, since these parameters govern intertemporal saving, decumulation, and wealth retention later in life. The participation moments identify instead the female work-cost parameters, since these shift the utility cost of employment and

[7] In our definition of the nominal net position, most borrowing is mortgage debt. To discipline the borrowing limit we use the median mortgage-debt-to-income ratio for new mortgagors in the Spanish Survey of Household Finances.

Table 3: Calibrated Parameters

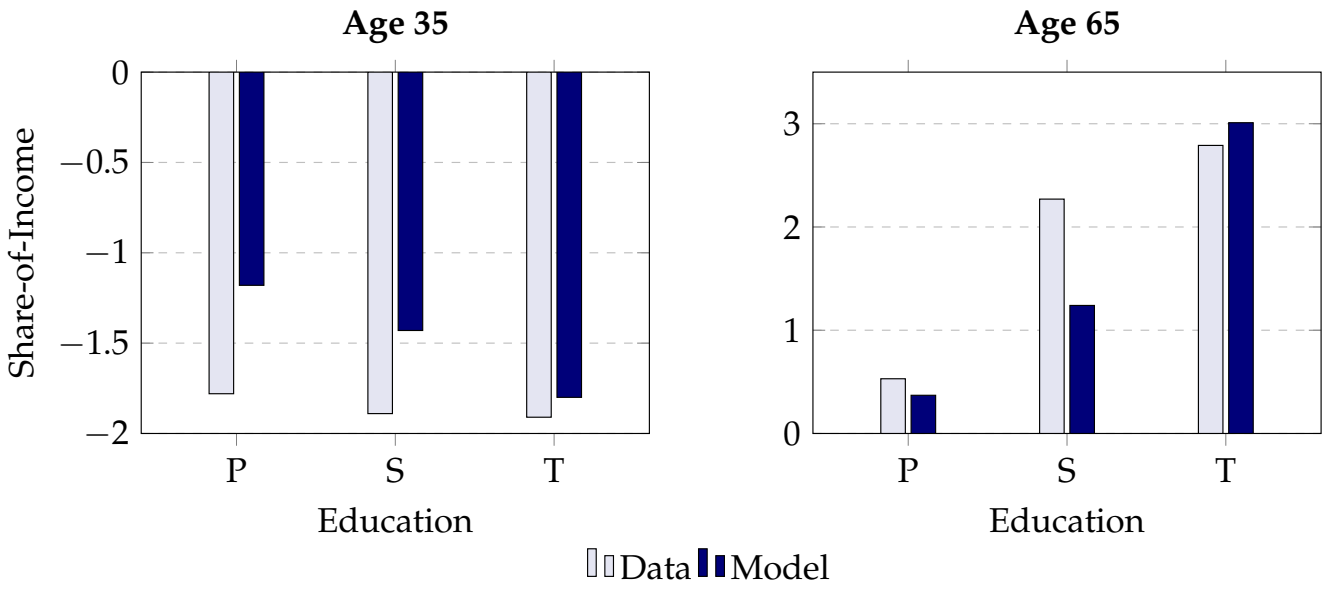
Time-Cost of Working: Single Females			
Parameter	Primary	Secondary	Tertiary
ψ_0	0.300	0.100	0.090
ψ_1	-0.030	-0.045	-0.005
ψ_2	0.001	0.001	-0.001
Time-Cost of Working: Females in Couples			
Parameter	Primary	Secondary	Tertiary
ψ_0	-0.670	-0.800	-0.850
ψ_1	-0.030	-0.038	-0.030
ψ_2	0.001	0.001	0.001
Other Parameters			
Parameter	Primary	Secondary	Tertiary
β	0.925	0.950	0.975
ϕ_1	6000	5550	1400
ϕ_2	1.000	0.300	0.100

therefore discipline extensive-margin labor supply for single women and women in couples. Table 3 reports the resulting estimates.

Table 3 suggests substantial heterogeneity in preferences and work frictions across groups. The calibrated time-cost parameters imply that the utility cost of market work varies both by education and by marital status, which is important for reproducing the observed participation differences between single women and women in couples over the life cycle. The calibrated discount factor increases with education, consistent with stronger asset accumulation among more educated households, while variation in the bequest parameters helps match differences in wealth retention later in life. Overall, the estimates imply that households differ not only in earnings opportunities, but also in their willingness to save and in the effective cost of supplying labor.

The model provides a close match to the moments that directly discipline savings and labor supply. Figure 1 shows that the model reproduces the life-cycle pattern of nominal net positions across education groups, a key object for the Fisher channel. For the sake of brevity, we relegate to Appendix B additional validation exercises on directly targeted moments, such as the model fit for life-cycle profiles of consumption and female labor-force participation; see Figures B.3 and B.4.

Figure 1: NNP over Income



Note: Data moments are author's own calculations based on the Spanish Survey of Household Finance, 2002–2022. On the x axis, 'P', 'S' and 'T' stand for primary, secondary and tertiary education, respictively.

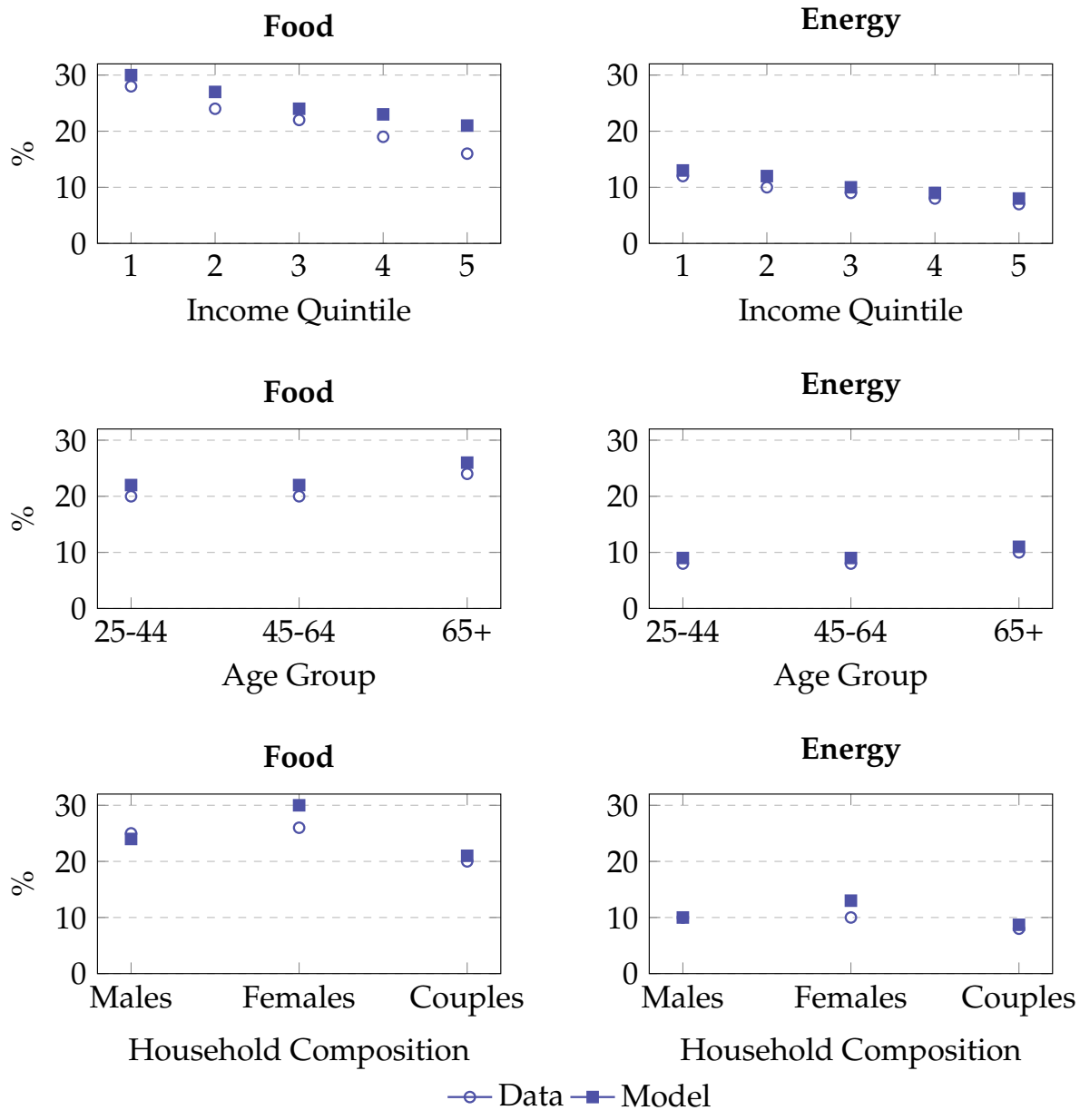
We also assess the model along dimensions that are not directly targeted in the SMM procedure. Figure 2 shows that the model captures the variation in food and energy expenditure shares across income, age, and household composition, while Figure 3 reports observed and model-implied household inflation rates during the 2021–2023 episode by income, age, and household type. Taken together, these ex-post untargeted checks show that the model captures closely the main cross-sectional patterns in expenditure composition and inflation exposure that are central for the welfare analysis below.

3.4 From empirical discipline to the four welfare costs of inflation

The quantitative strategy can be summarized in the same language as the four inflation costs derived in Section 2.5. The key point is that the empirical blocks of the model are chosen to discipline the household margins through which the observed inflation episode maps into welfare.

First, the real-income channel is disciplined by the estimated earnings process, the cross-sectional distribution of earnings by age, gender, and education, and the model's fit to female labor-force participation. These moments govern the distribution of labor income in the pre-inflation economy and the scope for labor-supply

Figure 2: Share of Food and Energy by Household Characteristics



Note: Data moments are author's own calculations based on the Spanish Household Budget Survey, 2006–2019.

adjustment along the extensive margin. Conditional on the assumed path for nominal earnings and prices, they therefore shape how the inflation shock translates into heterogeneous declines in real disposable income across households.

Second, fiscal drag is disciplined by tax and transfer schedules estimated on Spanish institutional evidence, together with the fact that all statutory rules apply to nominal income. Conditional on the observed nominal-income path, this block determines how much inflation raises effective tax burdens or lowers real transfers through bracket creep and incomplete indexation.

Third, the relative-price cost of inflation is disciplined by the QUAIDS demand system, the fit to expenditure shares across income, age, and household composition, and the observed category-specific price paths used in the transition experiment. These ingredients pin down both substitution responses and the incidence of necessity inflation. Consistent with this, the model also reproduces the untargeted heterogeneity in observed household inflation rates across demographic groups. Matching family composition is also important for equivalence-scale accounting, since households with similar resources but different family size face different effective consumption needs.

Fourth, the Fisher channel is disciplined by the life-cycle distribution of nominal net positions and by the estimated parameters governing savings and bequests. Matching these moments allows the model to assess how the inflation surprise redistributes between borrowers and savers across age and education groups.

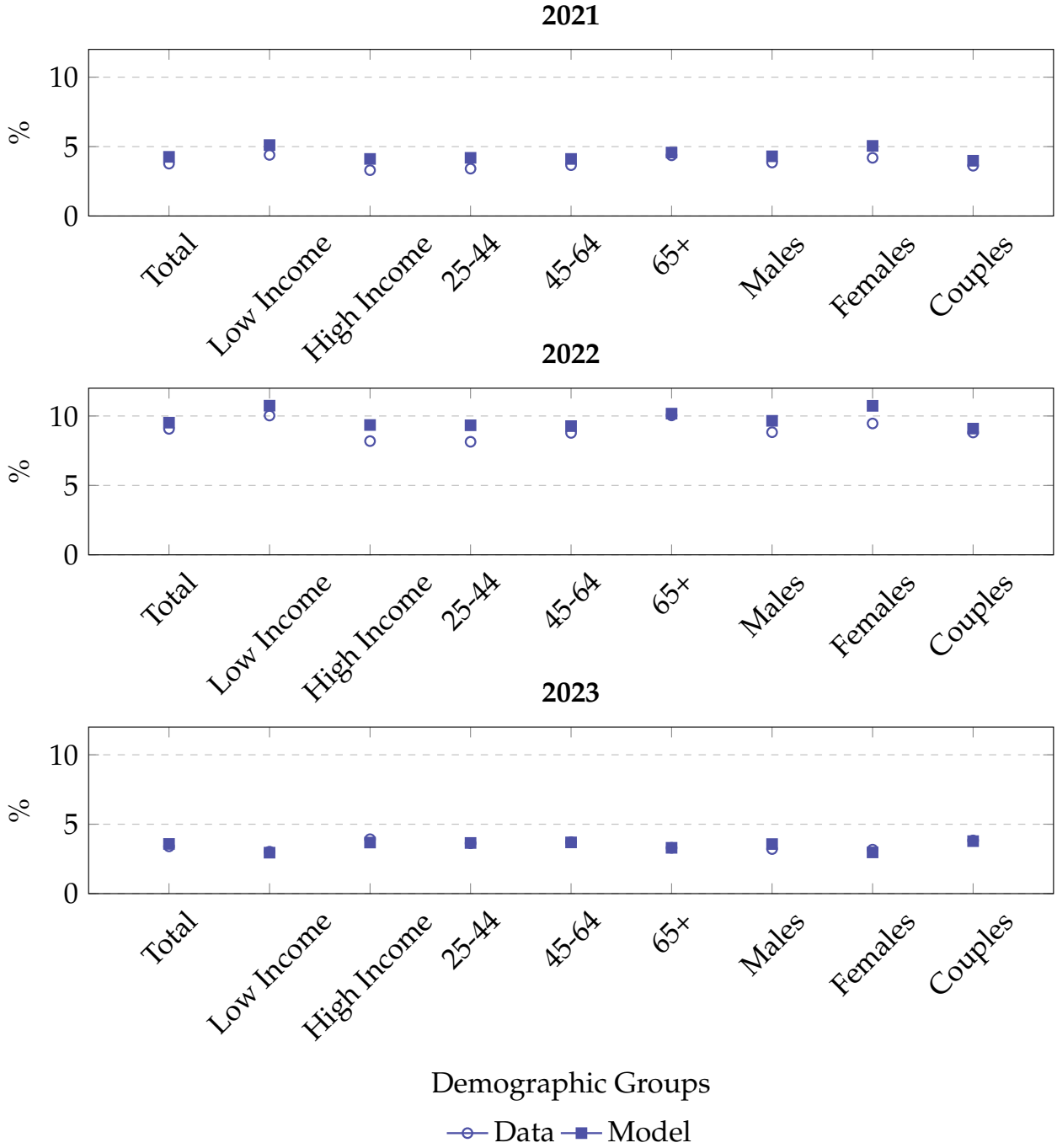
Taken together, these ingredients allow the model to quantify the welfare costs of the inflation surge, the channels through which they operate, and how alternative fiscal instruments insure households against them.

4 Results

4.1 Simulating the Inflation Surge

We model the inflation surge as a deterministic transition following an unanticipated aggregate shock. The economy is initially in the 2021 stationary equilibrium. At the beginning of the inflation episode, before household choices are made, households unexpectedly learn the full sequence of aggregate variables associated with the cost-of-living episode: category-specific prices, the aggregate price index, nominal wages, pension indexation, and fiscal rules, together with the terminal post-crisis environment. This sequence is not anticipated in the initial steady state. Once the

Figure 3: Inflation Rates by Household Characteristics



Note: Data moments are author's own calculations based on the Spanish Household Budget Survey, 2021–2023.

shock is realized, however, households perfectly foresee the remaining aggregate path. Hence the exercise is not a model of aggregate inflation risk or of inflation determination; it is a transition experiment that maps an observed inflationary disturbance into household choices and welfare.

The shock is common to all households, but its welfare effects differ because households enter the transition at different life-cycle states. We start from the stationary 2021 distribution over age, assets, education, productivity, family type, and children. Households alive at the beginning of the episode therefore face the same aggregate price and income paths, but at different ages, with different remaining horizons, nominal net positions, expenditure baskets, and exposure to the tax-transfer system. New cohorts entering during the transition solve the same problem conditional on the remaining announced path. After the inflation episode, the economy converges to the terminal steady state, with inflation rates and relative-price distortions returning to their long-run values.

Operationally, net-of-tax category prices and nominal incomes follow exogenous, time-varying paths taken from the data, while households make endogenous choices over consumption and its composition, savings, and labor supply. This allows us to trace how the observed disturbance maps into household behavior and welfare while remaining agnostic about price formation.

All price paths are constructed at constant VAT rates using data from the Spanish Statistical Agency, so the simulated inflation process isolates underlying producer-price dynamics from contemporaneous tax changes. We recover category-specific price series $(p_{j,t})$ for 2021–2025 and feed them into households' intratemporal problem. Because inflation differs across consumption categories, households face heterogeneous effective inflation rates through their endogenous expenditure composition and expenditure shares. Panel (a) of Figure 4 summarizes the implied dynamics for the prices of food, energy, and the VAT-category baskets.

Nominal income processes are also imposed exogenously and disciplined by institutional rules and aggregate data. First, pensions follow the statutory Spanish indexation rule, generating a deterministic sequence (b_t). Second, nominal wages track observed aggregate salary growth between 2021 and 2025, so labor income evolves as $(w_t e_i)$, with (w_t) pinned down by the data. Since households differ in expenditure composition, a common nominal wage path translates into different real income dynamics across households. Consistent with the data, average real wages remain below their pre-crisis level in 2025; see Panel (b) of Figure 4.

Conditioning on $(\{p_{j,t}, w_t, b_t\}_{t\geq 0})$, we solve for the transition equilibrium and

simulate the full adjustment path. Throughout this first exercise, fiscal policy is kept at the status quo, so this is our benchmark, or laissez-faire, equilibrium.

We also compute the spillover of the inflationary episode on the government budget constraint by allowing the tax and transfer basis to respond endogenously to higher prices and lower real incomes. Even abstracting from higher pension spending due to indexation, inflation raises net revenues. This is because the Spanish tax-and-transfer system is only imperfectly indexed: fixed nominal tax brackets and benefit thresholds generate bracket creep and benefit erosion. Panel (c) of Figure 4 shows that revenues rise during the inflation spike and remain above pre-shock levels as inflation subsides. These spillover effects are quantitatively conservative, since we abstract from the Fisher revaluation of nominal government liabilities, which would further strengthen public finances, as in Doepke and Schneider (2006).

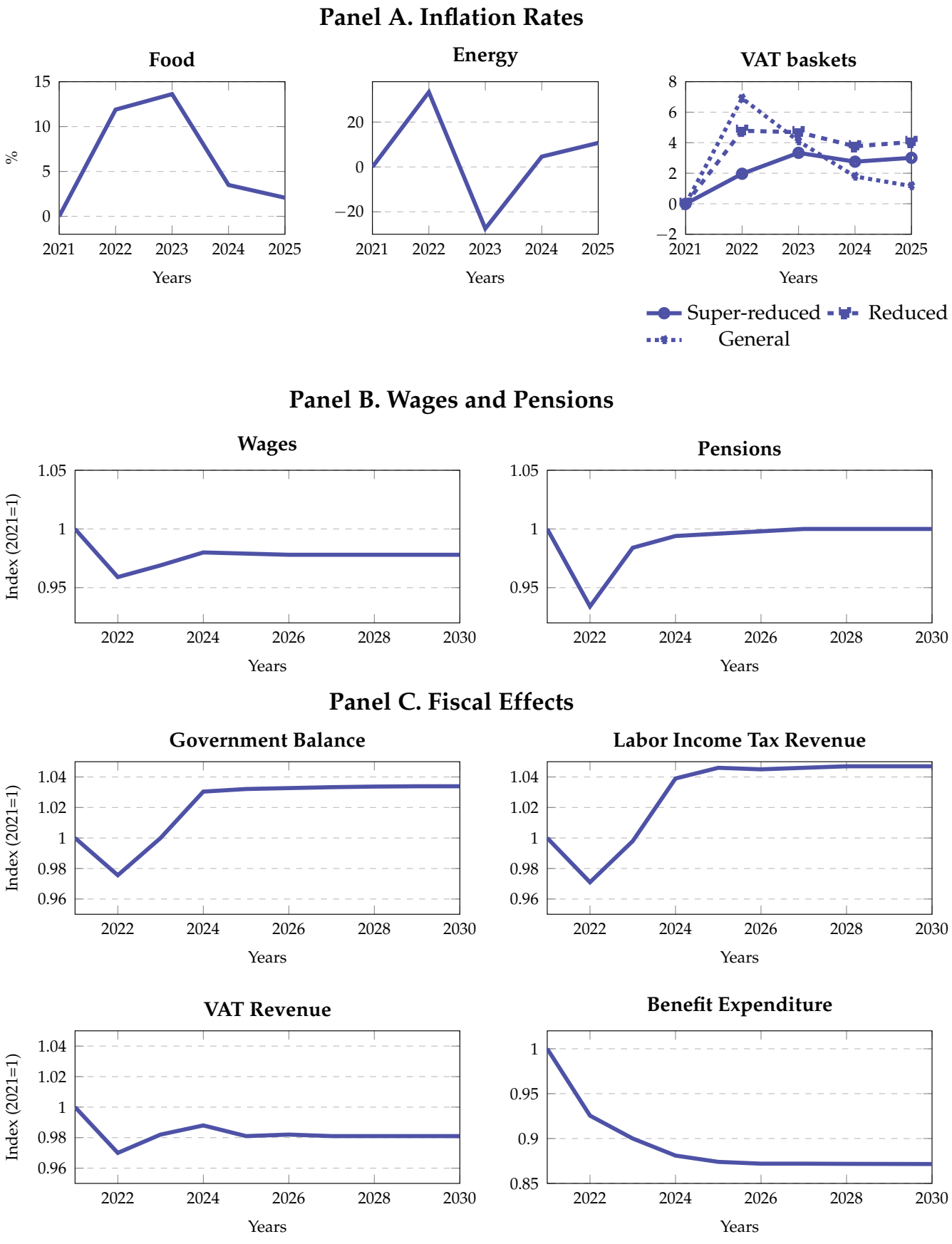
4.1.1 The Welfare Losses from the Inflation Surge

We quantify the welfare consequences of the inflationary transition across cohorts and household types using consumption-equivalent variation (CEV), defined as the uniform percentage change in consumption that makes a household indifferent between experiencing the inflation episode and remaining in the pre-shock steady state, following Lucas (1987). We compute household-level CEVs and aggregate them using a utilitarian population-weighted criterion over the entire transition economy, including both all households alive in 2021 and future newborns.

Table 4 shows that the welfare cost of the inflation surge in the *laissez-faire* equilibrium is substantial. In the aggregate, the welfare loss reaches 6.65% in CEV terms, but the burden is distributed very unevenly across households. Retirees lose more than 18%, savers more than 12%, and single women close to 10%, whereas younger households, borrowers, and families with children experience much smaller losses. This heterogeneity reflects differences in exposure to four mechanisms: relative-price changes, real-income erosion, Fisher redistribution, and fiscal drag.

The remaining columns of Table 4 decompose these losses sequentially. Starting from the full inflation episode, each subsequent column shuts down one channel relative to the previous specification: first relative-price movements, then the real-income decline, then Fisher redistribution, and finally fiscal drag. This decomposition allows us to quantify the contribution of each mechanism both in the aggregate and across household groups. At the aggregate level, relative-price movements account for 0.30 percentage points of the total welfare loss, the real-income channel for 1.94 points, Fisher redistribution for 2.02 points, and fiscal drag for the remaining

Figure 4: Simulation of the Inflation Surge: No Policy Scenario



Note: Wages, pensions and fiscal variables are all expressed in real terms.

Table 4: Welfare Cost of the Inflation Surge, No Policy (Lasseiz-Faire) Scenario

	Total	**- Rel. Prices**	**- Inc. Drop**	**- Fisher Eff.**	**- F. Drag**
All Households	6.65	6.35	4.41	2.39	0
NNP:					
Borrowers	2.37	2.08	0.36	2.37	0
Savers	12.24	11.95	9.71	2.42	0
Income:					
Bottom 25pc	6.51	5.92	3.55	3.40	0
Middle 50pc	7.04	6.70	4.75	2.41	0
Top 25pc	8.50	8.37	6.65	2.16	0
Age:					
25-44 Years Old	2.65	2.46	0.76	1.93	0
45-64 Years Old	3.16	2.95	1.83	2.47	0
65+ Years Old	18.20	17.63	14.15	3.04	0
Education:					
Primary	7.62	7.03	4.81	2.57	0
Secondary	6.75	6.53	4.51	2.01	0
Tertiary	4.97	5.13	3.71	2.31	0
Family:					
Single (M)	7.16	7.04	5.01	1.62	0
Single (F)	9.53	8.87	6.81	3.64	0
Couples	5.58	5.36	3.49	2.16	0
Fertility:					
No Children	8.43	8.10	5.98	2.53	0
1 Child	2.74	2.54	1.04	2.14	0
2+ Children	2.56	2.34	0.75	2.01	0

Note: At the top of the table: C is consumption, A is savings, L is for labor supply, Food and Energy indicates the share of each consumption component in the basket. *NNP* stands for nominal net position. Single (M) and (F) indicate single male and female, respectively.

Table 5: Inspecting the Mechanism: No Policy Scenario

	Cons.		Assets		Labor		Food		Energy	
	t=1	**LR**	**t=1**	**LR**	**t=1**	**LR**	**t=1**	**LR**	**t=1**	**LR**
Aggregate	-2.62	-3.42	-18.15	-23.33	-1.96	0.04	-5.41	3.15	9.48	-13.52
NNP:										
Borrowers	2.03	-3.08	4.35	0.94	-2.87	-0.12	-7.58	2.96	6.87	-13.53
Savers	-7.85	-3.81	-6.30	-3.26	0.13	-0.11	-2.51	3.44	13.01	-13.49
Income:										
Bottom 25pc	1.06	-2.31	1.86	3.72	-6.83	-0.34	-5.81	2.01	5.44	-10.62
Middle 50pc	-2.18	-3.28	-34.76	-35.76	-1.57	-0.17	-5.13	2.95	9.22	-12.97
Top 25pc	-7.22	-4.42	-5.98	-5.99	0.15	0.05	-3.33	4.01	12.99	-14.00
Age:										
25–44 Y	1.95	-3.32	3.50	0.06	-2.66	0.03	-7.89	3.18	7.09	-13.97
45–64 Y	-2.91	-3.36	-11.72	-16.17	-1.05	0.05	-6.33	3.28	9.17	-14.51
65+ Y	-11.20	-3.56	-6.07	-3.59	–	–	-1.10	2.85	12.80	-11.87
Education:										
Primary	-2.74	-3.24	-3.57	-22.35	-2.24	-0.17	-4.73	2.66	8.48	-11.91
Secondary	-1.86	-3.40	-39.58	-54.14	-2.49	0.04	-5.79	3.33	10.02	-14.33
Tertiary	-2.85	-3.58	-10.59	-8.38	-1.33	0.30	-6.70	4.14	11.49	-16.76
Family:										
Single (M)	-4.83	-3.25	-7.20	-7.03	–	–	-4.34	2.93	10.38	-13.39
Single (F)	-6.24	-3.75	-6.56	-4.13	-0.50	0.53	-3.82	2.32	7.54	-10.08
Couples	-1.76	-3.41	-7.72	-18.17	-3.08	-0.11	-6.44	3.59	10.21	-15.26
Fertility:										
0 Child	-4.86	-3.93	-9.02	-8.61	-1.23	0.21	-4.23	3.13	10.11	-12.71
1 Child	0.29	-3.24	7.60	4.31	-3.27	-0.59	-8.02	3.46	8.07	-15.06
2+ Children	1.18	-2.53	5.68	4.10	-3.34	-0.50	-8.68	3.27	8.02	-15.97

Note: At the top of the table: Cons. is consumption, Food and Energy indicates the share of each consumption component in the basket. *NNP* stands for nominal net position. Single (M) and (F) indicate single male and female, resectevely. All numbers are percentage changes realtive to the initial period, 2021. The t=1 period identifies the impact effect (2022), while LR is the long-run value in the new stationary equilibrium, relative to the initial steady state.

2.39 points.[8]

The relative-price channel is the smallest component in the aggregate, but it is crucial for understanding the *cost-of-living* nature of the episode. Inflation is concentrated in food and energy, which are necessity goods in the estimated demand system, so households that devote larger expenditure shares to these categories experience a stronger effective price increase. This is why the relative-price channel matters disproportionately for poorer, less educated households and retirees, who devote a large share of their income to food and energy, see Figure 2. By contrast, the real-income channel is large because nominal wages and transfers do not keep pace with prices, while adjustment through labor supply provides only limited insurance. This channel is more evenly distributed across the population as income erosion is assumed to be homogeneous.

Fisher redistribution instead operates through balance sheets: inflation reduces the real value of nominal assets and liabilities, benefiting borrowers and hurting savers. This mechanism helps explain why younger households and families with children gain from it (i.e., their losses is higher without Fisher effect), while asset-rich and older households suffer large losses. Finally, fiscal drag further compresses disposable income because inflation interacts with a nominal fiscal system in ways that are especially costly for poorer households and single women. These households are hit twice: bracket creep raises their effective tax burden as nominal incomes drift upward, while at the same time the real value of transfers and subsidies declines when benefits are not fully indexed. Fiscal drag therefore reduces net resources from both sides of the budget constraint.

Table 5 links the welfare losses from inflation to household adjustment along four margins: consumption, assets, labor supply, and expenditure composition. In the aggregate, consumption falls on impact and remains below its initial level in the long run because inflation reduces real disposable resources. Assets also decline persistently, both because households draw them down to smooth the shock and because inflation erodes the real value of nominal savings. Labor supply falls on impact and then largely returns toward its initial level, while expenditure shares adjust sharply in response to the relative-price shock, with food shares falling and energy shares rising initially before both continue to move as the economy converges to a new stationary allocation.

These aggregate responses mask substantial heterogeneity across households.

[8] Because of non-linearities, the contribution of each channel depends on the ordering of the decomposition. In practice, however, alternative orderings deliver very similar quantitative conclusions, see Appendix C.3.

First, the consumption response differs because inflation affects real resources unevenly across the distribution. Borrowers, younger households, and families with children are better able to sustain consumption on impact, and in some cases even increase it temporarily, because the erosion of nominal debt relaxes their balance-sheet position. By contrast, savers, retirees, and singles cut consumption more sharply because they are more exposed to losses on nominal assets and have less scope to smooth the shock. Differences in expenditure baskets reinforce these patterns: households that devote a larger share of spending to necessities face a larger effective decline in purchasing power and therefore a stronger compression in consumption.

Second, asset adjustment is equally heterogeneous. For households with positive nominal asset positions, especially savers and older households, inflation directly reduces real wealth through the Fisher channel, leading to a persistent weakening of balance sheets. Borrowers instead benefit from the erosion of nominal liabilities and are therefore partly shielded from the shock. This balance-sheet heterogeneity is central for welfare because it affects not only current resources but also future self-insurance capacity.

Finally, female labor-supply responses are also uneven across groups. The aggregate decline partly reflects the fact that those women that benefit most from Fisher redistribution have less need to offset the shock through additional work. This is particularly visible among younger women, borrowers, and families with children, where labor falls more on impact. By contrast, savers display little labor adjustment. Thus, labor responses do not simply reflect a uniform fall in real wages, but rather the interaction between inflation, household balance sheets, and the available adjustment margin within the household.

4.2 The Counterfactual Exercises

We evaluate two revenue-neutral fiscal counterfactuals within the same transition framework used above in 4.1, i.e., households are surprised by the initial aggregate shock, but once the policy path is realized they perfectly foresee the remaining price, income, tax, and transfer paths.. In both cases, the observed paths of prices and nominal incomes are taken as given, and households re-optimize over consumption and its composition, savings, and labor supply. The first counterfactual replicates the temporary VAT reductions on food and energy implemented in Spain during 2021–2023. The second considers an expansion of means-tested transfers while leaving VAT rates unchanged at their no-policy values. Both interventions use the same

Table 6: Comparing VAT Cuts with Benefit Expansion

Panel A: Welfare by Household Group

	Benchmark	VAT Cuts	Benefit Expansion
Aggregate	6.65	6.41	6.17
NNP:			
Borrowers	2.37	2.60	2.00
Savers	12.24	11.39	11.61
Income:			
Bottom 25%	6.51	6.38	5.42
Middle 50%	7.03	6.78	6.51
Top 25%	8.50	8.04	8.14
Age:			
25–44 Y	2.65	2.84	2.41
45–64 Y	3.16	3.09	2.86
65+ Y	18.20	16.75	17.06
Education:			
Primary	7.62	7.30	6.91
Secondary	6.75	6.34	6.38
Tertiary	4.96	4.95	4.80
Family:			
Single (M)	7.16	6.88	6.76
Single (F)	9.53	9.15	8.45
Couples	5.58	5.40	5.27
Fertility:			
No Children	8.43	8.01	7.84
1 Child	2.73	2.89	2.51
2+ Children	2.55	2.71	2.34

Panel B: Welfare Decomposition

	Benchmark	VAT Cuts	Benefit Expansion
Baseline	6.65	6.41	6.17
No Relative Prices	6.35	5.93	5.87
No Income Drop	4.41	4.12	3.92
No Fisher Effect	2.39	2.34	1.84
No Fiscal Drag	0.00	0.00	-0.63

Note: Entries in Panel A report welfare losses in consumption-equivalent variation (percent). Entries in Panel B report the effects on overall welfare removing one channel at the time for the different policy regimes. Negative entries indicate net welfare gains. In particular, under the benefit expansion, removing all inflation-related costs need not eliminate the welfare gain from the policy itself, because transfers remain above the benchmark level.

fiscal resources period-by-period, so the comparison isolates how price relief versus disposable-income support shapes aggregate insurance and its distribution across households. Results are summarized in Table 6, with transition dynamics in Figure 5 and adjustment margins in Table 7.

4.2.1 VAT Cuts

We first evaluate the temporary VAT reductions on energy and food implemented in Spain during 2021–2023. Electricity VAT was reduced from 21% to 10% in July 2021 and further to 5% in July 2022. In January 2023, VAT on essential food products was reduced from 8% to 6%. We treat 2021 as the steady-state baseline and embed the July 2021 electricity VAT reduction in the calibration. Starting earlier would require explicitly modeling the COVID shock and the associated emergency fiscal and labor-market interventions, which would introduce additional wedges unrelated to the inflation episode itself.[9]

Figure 5 shows the direct effect of the policy on the inflation path. VAT cuts create a wedge between constant-tax and policy inflation in the targeted categories: in 2022, energy inflation falls by 9.85 percentage points relative to the no-policy scenario, and in 2023 food inflation falls by 1.62 points. Headline inflation also declines, but by less, since food and energy are only part of the total consumption basket. The instrument therefore works most directly on the *composition* of inflation, by compressing the relative-price pressure coming from necessities.

This feature is both the strength and the limitation of the policy. VAT cuts directly relax the relative-price distortion created by necessity inflation, and this is particularly relevant in an episode where food and energy prices are the main source of dispersion in effective inflation rates across households. At the same time, the policy does much less to offset the broader sources of welfare loss associated with sluggish nominal income adjustment, imperfect indexation, and the interaction of inflation with nominal balance sheets.

Table 7 shows how this maps into household behavior. Aggregate consumption changes little relative to the benchmark, which reflects both intertemporal smooth-

[9] Our benchmark counterfactual assumes full pass-through of VAT changes to consumer prices. Under partial pass-through, the tax cut would translate into a smaller decline in consumer prices, so the reduction in effective inflation – and thus the welfare gains from VAT relief – would be weaker. Although the exact quantitative effect would depend on household re-optimization and the endogenous response of tax bases, the qualitative implication is clear: incomplete pass-through would tend to reduce the welfare gains from VAT cuts and therefore, if anything, strengthen the relative ranking of targeted income support in our setting.

ing and the temporary nature of the intervention. Instead, the main aggregate response occurs through balance sheets. Relative to the no-policy benchmark, the decline in assets is substantially attenuated. By lowering realized inflation, VAT cuts protect the real value of nominal assets, but they also reduce the erosion of nominal liabilities. In this sense, the policy operates not only through contemporaneous price relief, but also through intertemporal balance-sheet effects.

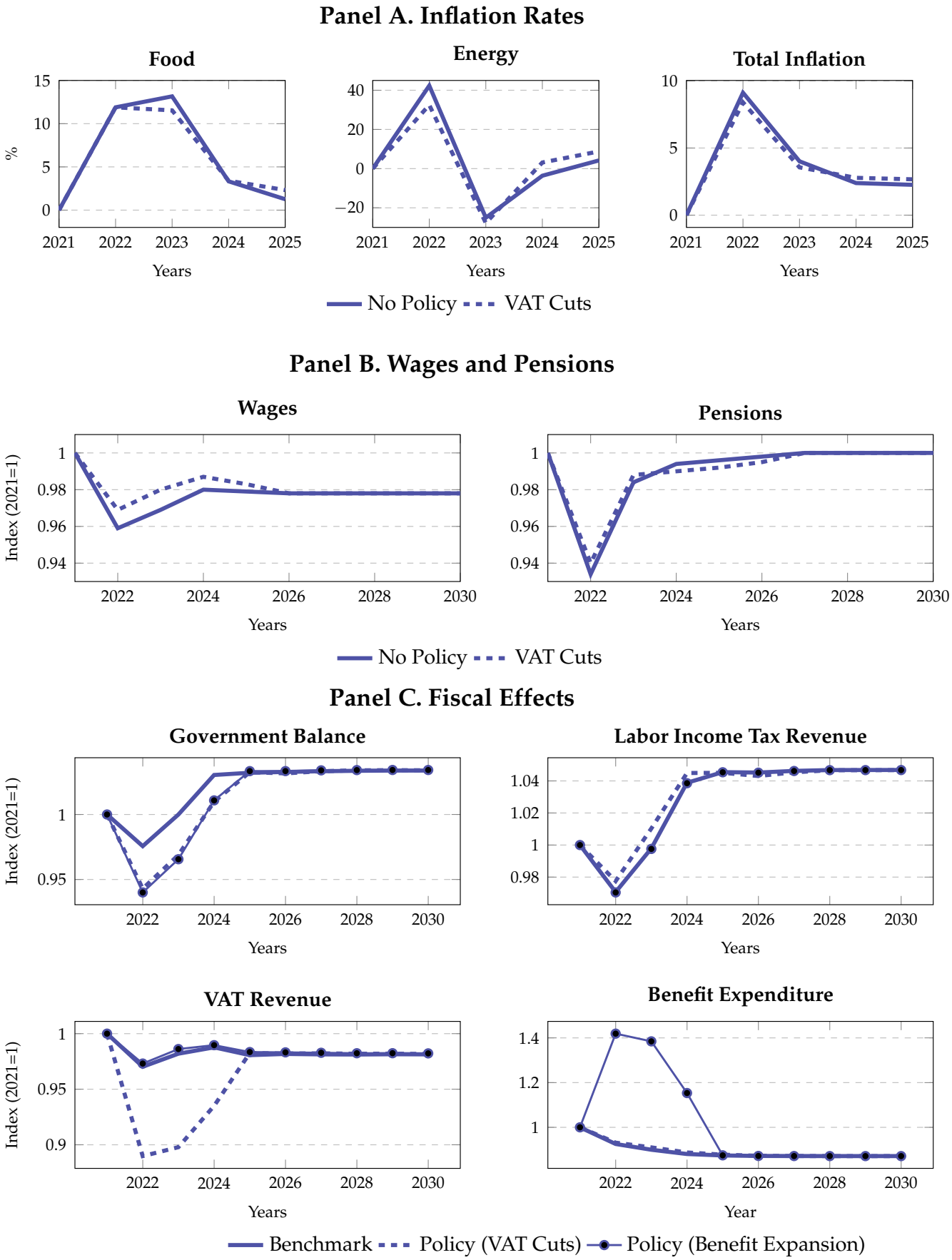
These mechanisms explain the welfare results in Table 6. Aggregate welfare losses decline from 6.65% under laissez-faire to 6.41% under VAT cuts, a 0.24 percentage point improvement. The gains are therefore sizeable, but limited. The policy cushions the inflation episode without overturning its basic distributional structure, which is what one would expect from an instrument that lowers necessity-price inflation without materially changing the real-wage path or the broader nominal environment.

Who gains depends on the source of exposure in the benchmark. Savers benefit because lower inflation protects the real value of nominal assets: their losses fall from 12.24% to 11.39%. Borrowers instead lose part of the debt relief embedded in the benchmark, so their losses rise from 2.37% to 2.60%. The same logic explains the age profile. Retirees gain the most because they are heavily exposed to food and energy prices, hold nominal assets, and have little scope to adjust labor income. Younger households, by contrast, rely more on labor income and benefit more from liability erosion, so lower inflation can make them worse off.

Across the income distribution, gains are smaller and more even, because VAT cuts are not tightly targeted by income. They help households in proportion to their exposure to taxed necessities and their nominal balance-sheet positions, rather than simply in proportion to earnings. Panel B of Table 6 confirms this interpretation: the aggregate gains come mainly through the relative-price channel and, to a lesser extent, the real-income channel, while the Fisher channel matters mainly for incidence. Fiscal drag changes comparatively little, so the main role of the policy is to compress necessity-price inflation rather than to undo the broader fiscal transmission of the shock.

Panel C of Figure 5 reports the fiscal implications. By construction, VAT cuts reduce indirect tax revenues on impact, while labor tax revenues change only modestly. The government balance therefore deteriorates in the short run relative to no policy, but the gap narrows as inflation subsides. Overall, VAT cuts provide meaningful insurance, but their gains remain limited and tilted toward retirees and savers.

Figure 5: Simulation of the Inflation Surge: Policy Counterfactuals.



Note: Wages, pensions and fiscal variables are all expressed in real terms.

Table 7: Inspecting the Mechanism: Policy Counterfactuals.

Panel A. VAT Cuts

	Cons.		Assets		Labor		Food		Energy	
	t=1	**LR**	**t=1**	**LR**	**t=1**	**LR**	**t=1**	**LR**	**t=1**	**LR**
Aggregate	-2.62	-3.29	-14.44	-16.94	-1.69	-0.01	-3.21	2.98	5.39	-12.76
NNP:										
Borrowers	1.74	-3.07	4.04	0.92	-2.55	-0.12	-5.23	2.84	3.06	-12.74
Savers	-7.50	-3.55	-5.51	-2.89	0.31	0.08	-0.53	3.20	8.50	-12.80
Income:										
Bottom 25pc	0.77	-2.14	1.93	5.34	-6.96	-0.41	-3.92	1.86	2.55	-10.05
Middle 50pc	-2.19	-3.16	-27.50	-21.82	-1.19	-0.23	-3.03	2.78	5.29	-12.25
Top 25pc	-7.08	-4.25	-5.09	-5.33	0.15	0.05	-1.00	3.81	8.49	-13.21
Age:										
25–44 Y.	1.70	-3.25	3.30	0.42	-2.29	-0.0	-5.50	3.03	3.05	-13.17
45–64 Y.	-2.79	-3.20	-9.35	-11.24	-0.90	-0.03	-3.93	3.10	4.95	-13.71
65+ Y.	-10.91	-3.34	-5.30	-3.04	–	–	0.63	2.66	8.84	-11.24
Education:										
Primary	-2.63	-3.11	-1.65	-15.85	-2.02	-0.23	-2.82	2.51	4.85	-11.25
Secondary	-1.82	-3.28	-32.73	-39.88	-2.20	-0.01	-3.55	3.16	5.59	-13.53
Tertiary	-2.94	-3.44	-8.67	-6.15	-1.00	0.27	-3.89	3.93	6.52	-15.82
Family:										
Single (M)	-4.97	-3.08	-5.72	-5.10	–	–	-2.13	2.76	6.47	-12.65
Single (F)	-6.03	-3.60	-5.66	-3.12	-0.53	0.45	-2.09	2.18	4.52	-9.51
Couples	-1.76	-3.28	-5.46	-13.0	-2.61	-0.17	-4.03	3.41	5.52	-14.40
Fertility:										
0 Children	-4.75	-3.79	-7.86	-7.24	-1.06	0.16	-2.19	2.97	6.13	-11.99
1 Child	0.19	-3.13	7.60	5.24	-2.89	-0.65	-5.48	3.29	3.70	-14.21
2+ Children	0.98	-2.42	5.56	4.70	-2.83	-0.56	-6.01	3.09	3.51	-15.09
Panel B. Benefit Expansion										
Aggregate	-2.35	-3.34	-14.33	-18.79	-2.19	-0.02	-5.55	3.10	9.32	-13.57
NNP:										
Borrowers	2.42	-2.98	4.66	1.02	-3.12	-0.13	-7.80	2.90	6.61	-13.61
Savers	-7.70	-3.77	-6.04	-3.20	0.02	0.01	-2.58	3.42	12.94	-13.51
Income:										
Bottom 25pc	1.70	-2.12	3.10	5.59	-7.99	-0.59	-6.00	1.94	5.21	-10.71
Middle 50pc	-1.85	-3.19	-25.86	-25.19	-1.73	-0.23	-5.29	2.90	9.02	-13.02
Top 25pc	-7.09	-4.33	-5.67	-5.56	0.15	0.05	-3.42	3.97	12.88	-14.05
Age:										

Continued on next page...

Table 7 – continued from previous page.

	C		A		L		Food		Energy	
	t=1	LR	t=1	LR	t=1	LR	t=1	LR	t=1	LR
25–44 Y.	2.32	-3.25	3.89	0.41	-2.88	-0.01	-8.08	3.15	6.87	-14.01
45–64 Y.	-2.72	-3.27	-9.51	-13.02	-1.27	-0.04	-6.41	3.23	9.12	-14.57
65+ Y.	-10.91	-3.43	-5.80	-3.24	–	–	-1.27	2.79	12.55	-11.93
Education:										
Primary	-2.42	-3.12	2.42	-15.49	-2.58	-0.26	-4.85	2.61	8.34	-11.97
Secondary	-1.53	-3.32	-32.20	-43.83	-2.71	-0.0	-6.01	3.29	9.75	-14.38
Tertiary	-2.63	-3.52	-9.77	-7.44	-1.41	0.28	-6.84	4.10	11.35	-16.80
Family:										
Single (M)	-4.59	-3.12	-6.06	-5.63	–	–	-4.46	2.87	10.24	-13.46
Single (F)	-5.78	-3.60	-5.82	-3.01	-0.70	0.37	-4.01	2.27	7.26	-10.14
Couples	-1.51	-3.34	-4.83	-15.14	-3.38	-0.16	-6.57	3.55	10.09	-15.30
Fertility:										
0 Children	-4.59	-3.84	-8.17	-7.62	-1.42	0.15	-4.35	3.09	9.96	-12.76
1 Child	0.58	-3.17	8.11	4.93	-3.50	-0.66	-8.20	3.42	7.87	-15.11
2+ Children	1.48	-2.46	6.02	4.50	-3.67	-0.56	-8.87	3.22	7.82	-16.02

Note: At the top of the table: Cons. is consumption, Food and Energy indicates the share of each consumption component in the basket. *NNP* stands for nominal net position. Single (M) and (F) indicate single male and female, respectively. t=1 identifies the impact effect, while LR is the long-run value in the new stationary equilibrium, relative to the status quo.

4.2.2 Revenue-Neutral Expansion of Targeted Income Support

We next study a revenue-neutral temporary expansion of Spain's existing targeted income-support system. Rather than introducing a new transfer technology, we approximate the pre-crisis schedule of means-tested support with the reduced-form rule in equation (12), calibrated to match the level and income incidence of targeted cash assistance in Spanish microdata. The policy experiment then temporarily increases the generosity of this existing schedule during the inflation episode, while preserving its targeting structure, so that the implied fiscal cost matches that of the VAT cuts period by period.[10,11]

[10]Operationally, we temporarily scale up the parameters g_0 and g_1 in equation (12), while holding g_2 fixed, so that the implied path of net fiscal revenues matches the dynamic revenue response generated by the VAT cuts. This counterfactual is not meant to replicate the institutional details of any single Spanish program one-for-one. Rather, it captures a temporary increase in the generosity of the existing targeted support system, holding fixed its basic income-targeting structure.

[11]We impose fiscal equivalence period by period rather than in present value. In an environment with incomplete markets and borrowing constraints, Ricardian equivalence does not hold, so two

Table 6 shows that the transfer expansion provides stronger aggregate insurance than VAT relief. Welfare losses fall from 6.65% to 6.17%, a 0.48 percentage point improvement, compared with 0.24 points under VAT cuts. At the same fiscal cost, transfers therefore generate roughly twice the aggregate gain.

The reason is that the two instruments operate on different margins. VAT cuts reduce the prices households pay for necessities, whereas transfers leave relative prices largely unchanged and support disposable income directly. This difference is visible in Table 7: under the expansion of the existing means-tested support schedule, the food and energy blocks remain close to the benchmark, but aggregate consumption contracts less on impact. The policy does not remove necessity inflation; it offsets its consequences for household budgets.

This distinction matters because the benchmark welfare loss is driven more by nominal channels than by relative-price distortions alone. In the maintained environment of the model, transfers therefore operate more directly on the main household-side source of aggregate welfare gain. They stabilize purchasing power for households that are most exposed to sluggish nominal adjustment and have limited self-insurance. At the same time, because inflation itself is not compressed, the Fisher redistribution embedded in the benchmark largely remains in place. Borrowers continue to benefit from debt erosion while also receiving additional income support, which makes the policy especially effective for leveraged and liquidity-constrained households.

This is why the distributional pattern differs from VAT relief. Borrowers gain substantially, with welfare losses falling from 2.37% to 2.00%, and the bottom income quartile sees losses decline from 6.51% to 5.42%. Working-age households also benefit more than under VAT cuts, because they are more exposed to labor-income losses and more likely to be liquidity constrained. Retirees still gain, but less than under VAT relief, since transfers do not directly compress food and energy inflation. The transfer expansion therefore tilts protection toward households whose vulnerability comes mainly from weak cash flow and limited self-insurance, rather than from expenditure composition and nominal asset holdings.

The main trade-off is that direct income support reduces labor supply somewhat more. This is a standard wealth effect: once disposable income is stabilized, households need less labor adjustment to smooth consumption. In the model this response is concentrated among women, whose labor supply adjusts on the extensive margin.

policies with the same present-value fiscal cost but different timing of resource transfers need not have comparable welfare effects. Imposing equivalence period by period ensures that the comparison isolates the policy instrument rather than the timing of fiscal support.

From a welfare perspective, however, this is part of the insurance value of the policy, since households can avoid costly labor-supply responses to the shock.

Panel B of Table 6 confirms this interpretation. Under the benefit expansion, the dominant gains come through the real-income channel, while the relative-price contribution remains close to the benchmark because the inflation process itself is largely unchanged. The Fisher channel also remains quantitatively important because the policy preserves inflation-induced balance-sheet revaluation. Negative entries can arise because, once a given inflation-related distortion is removed, the transfer expansion may still leave households better off than in the benchmark by directly raising disposable income.

Panel C of Figure 5 illustrates the fiscal implementation. Benefit expenditure rises sharply on impact, while VAT revenues remain close to the benchmark path. The government balance therefore reflects a reallocation of fiscal resources toward transfers rather than a change in the overall fiscal envelope. Overall, the transfer expansion delivers larger welfare gains than VAT cuts because it insures households against the dominant margin in this episode: the erosion of real disposable income in an economy with incomplete markets, borrowing constraints, and imperfect indexation.[12]

5 Conclusion

This paper studies the household welfare consequences of the recent cost-of-living crisis through a structural life-cycle model with incomplete markets, non-homothetic demand, and rich demographic heterogeneity, in which saving, expenditure composition, and labor supply are endogenous. Its central contribution is to evaluate how alternative fiscal responses to a major inflation episode shape both aggregate welfare losses and their distribution across households.

In the *laissez-faire* benchmark, aggregate welfare losses reach 6.65% in consumption-equivalent terms and are highly unequal, reflecting heterogeneous exposure to necessity-price inflation, real-income erosion, Fisher redistribution, and fiscal drag. The policy experiments show that the design of intervention matters as much as its fiscal scale: temporary VAT cuts provide meaningful but limited insurance and tilt gains toward retirees and savers, whereas a revenue-neutral expansion of targeted income sup-

[12] Appendix C reports the full group-level decomposition for the VAT-cut and benefit-expansion regimes, and show that these differences in transmission are also reflected systematically across income, age, education, family type, and nominal net positions.

port delivers larger gains in our maintained environment and stronger protection for borrowers, lower-income households, and working-age families. More broadly, the paper highlights the value of evaluating inflation episodes through the lens of household welfare rather than aggregate price movements alone.

References

Amores, Antonio F., Henrique Basso, Johannes Simeon Bischl, Paola De Agostini, Silvia De Poli, Emanuele Dicarlo, Maria Flevotomou, Maximilian Freier, Sofia Maier, Esteban García-Miralles, Myroslav Pidkuyko, Mattia Ricci and Sara Riscado. (2025). "Inflation, fiscal policy, and inequality: The impact of the post-pandemic price surge and fiscal measures on European house-holds". *Review of Income and Wealth*, 71(1/e12713). https://doi.org/10.1111/roiw.12713

Auclert, Adrien. (2019). "Monetary policy and the redistribution channel". *American Economic Review*, 109(6), pp. 2333-2367. https://doi.org/10.1257/aer.20160137

Auclert, Adrien, and Matthew Rognlie. (2021). "Inequality and aggregate demand". *Mimeo*, Stanford University.

Banks, James, Richard Blundell and Arthur Lewbel. (1997). "Quadratic Engel curves and consumer demand". *The Review of Economics and Statistics*, 79(4), pp. 527-539. https://doi.org/10.1162/003465397557015

Benhabib, Jess, Alberto Bisin and Mi Luo. (2019). "Wealth distribution and social mobility in the US: A quantitative approach". *American Economic Review*, 109(5), pp. 1623-1647. https://doi.org/10.1257/aer.20151684

Bewley, Truman. (1977). "The permanent income hypothesis: A theoretical formulation". *Journal of Economic Theory*, 16(2), pp. 252-292. https://doi.org/10.1016/0022-0531(77)90009-6

De Nardi, Mariacristina. (2004). "Wealth inequality and intergenerational links". *The Review of Economic Studies*, 71(3), pp. 743-768. https://doi.org/10.1111/j.1467-937X.2004.00302.x

De Nardi, Mariacristina, Giulio Fella and Gonzalo Paz-Pardo. (2024). "Wage risk and government and spousal insurance". *The Review of Economic Studies*, 92(2), pp. 954-980. https://doi.org/10.1093/restud/rdae042

Deaton, Angus, and John Muellbauer. (1980). "An almost ideal demand system". *The American Economic Review*, 70(3), pp. 312-326. https://www.jstor.org/stable/1805222

Doepke, Matthias, and Martin Schneider. (2006). "Inflation and the redistribution of nominal wealth". *Journal of Political Economy*, 114(6), pp. 1069-1097. https://doi.org/10.1086/508379

García-Miralles, Esteban, Maximilian Freier, Sara Riscado, Chrysa Leventi, Alberto Mazzon, Glenn Abela, Laura Boyd, Baiba Brusbārde, Marion Cochard, David Cornille, Emanuele Dicarlo, Ian Debattista, Mar Delgado-Téllez, Mathias Dolls, Ludmila Fadejeva, Maria Flevotomou, Florian Henne, Alena Harrer-Bachleitner, Viktor Jászberényi-Király, Lara Wemans. (2026). "Fiscal drag in theory and in practice: A European perspective". *European Economic Review*, 185(105275). https://doi.org/10.1016/j.euroecorev.2026.105275

García-Miralles, Esteban, Nezih Guner and Roberto Ramos. (2019). "The Spanish personal income tax: facts and parametric estimates". SERIEs, 10, pp. 439-477. https://doi.org/10.1007/s13209-019-0197-5

Gorman, William M. (1959). "Separable utility and aggregation". *Econometrica: Journal of the Econometric Society*, 27(3), pp. 469-481. https://doi.org/10.2307/1909472

Gourinchas, Pierre-Olivier, and Jonathan A. Parker. (2003). "Consumption over the life cycle". *Econometrica,* 70(1), pp. 47-89. https://doi.org/10.1111/1468-0262.00269

Guner, Nezih, Ezgi Kaya and Virginia Sánchez-Marcos. (2024). "Labor market institutions and fertility". *International Economic Review,* 65(3), pp. 1551-1587. https://doi.org/10.1111/iere.12708

Guner, Nezih, Javier López-Segovia and Roberto Ramos. (2020). "Reforming the individual income tax in Spain". SERIEs, 11, pp. 369-406. https://doi.org/10.1007/s13209-020-00224-2

Heathcote, Jonathan, Kjetil Storesletten and Giovanni L. Violante. (2014). "Consumption and labor supply with partial insurance: An analytical framework". *American Economic Review,* 104(7), pp. 2075-2126. https://doi.org/10.1257/aer.104.7.2075

Huggett, Mark. (1993). "The risk-free rate in heterogeneous-agent incomplete-insurance economies". *Journal of Economic Dynamics and Control,* 17(5-6), pp. 953-969. https://doi.org/10.1016/0165-1889(93)90024-M

Imrohoroğlu, Ayşe. (1989). "Cost of business cycles with indivisibilities and liquidity constraints". *Journal of Political Economy,* 97(6), pp. 1364-1383. https://doi.org/10.1086/261658

Kaplan, Greg, Benjamin Moll and Giovanni L. Violante. (2018). "Monetary policy according to HANK". *American Economic Review,* 108(3), pp. 697-743. https://doi.org/10.1257/aer.20160042

Lucas, Robert E. Jr. (1987). Models of business cycles. Oxford: Basil Blackwell.

Macnamara, Patrick, Myroslav Pidkuyko and Raffaele Rossi. (2026). "Taxing consumption in unequal economies". *Journal of Political Economy Macroeconomics.* Forthcoming.

Olivi, Alan, Vincent Sterk and Dajana Xhani. (2026). "Optimal monetary policy during a cost-of-living crisis". *Mimeo,* University College London.

Organisation for Economic Co-operation and Development (OECD). (2025). *OECD employment outlook 2025: Spain.* https://www.oecd.org/en/publications/oecd-employment-outlook-2025-country-notes_f91531f7-en/spain_ded48eec-en.html

Ortega Carrillo, Julio, and Roberto Ramos. (2024). "Parametric estimates of the Spanish personal income tax in 2019". Documentos Ocasionales, 2423, Banco de España. https://repositorio.bde.es/handle/123456789/37494

Pallotti, Filippo, Gonzalo Paz-Pardo, Jiri Slacalek, Oreste Tristani and Giovanni L Violante. (2024). "Who bears the costs of inflation? Euro area households and the 2021-2023 shock". *Journal of Monetary Economics,* 148(103671). https://doi.org/10.1016/j.jmoneco.2024.103671

Parodi, Francesca. (2023). "Taxation of consumption and labor income: A quantitative approach". *American Economic Journal: Macroeconomics,* 15(4), p. 177-216. https://doi.org/10.1257/mac.20200289

A Recursive Representation of the Model and Numerical Solution

A.1 Dynamic problem of the individuals

We solve the model backwards, starting from the last period of life (denoted by J) until birth (period 1 in the model). Let j denote age and suppress education for ease of exposition. Let $\tilde{P}_j$ denote the vector of relative consumer prices entering the indirect utility function $v(\tilde{P}_j, c_j)$, and let P_j denote the aggregate consumption price index used to convert nominal tax bases into real terms. We write all household problems in real terms. Thus, a_j denotes beginning-of-period real assets, a_{j+1} next-period real assets, and c_j total real consumption expenditure. We further define the gross real return on beginning-of-period assets as

$$q_j \equiv (1 + R_j)\frac{P_{j-1}}{P_j}.$$

Real labor income and pension income are denoted by lowercase variables, while the statutory tax and transfer functions are evaluated on their nominal counterparts. In particular, nominal capital income is

$$Y_{k,j} = R_j P_{j-1} a_j,$$

and for any real income component x_j, the corresponding nominal tax base is $P_j x_j$.

A.1.1 Last period of life: $j = J$

In the last period of life households solve the following problems.

Single males and females Formally, the dynamic problem of a single retired individual of gender g is given by

$$R_J^g(a_J, z_g) = \max_{c_J, a_{J+1}} u(v(\tilde{P}_J, c_J), 1) + \phi(a_{J+1}) \tag{18}$$

$$\text{s.t.} \quad c_J + a_{J+1} = q_J a_J + b_J(z_g) - \frac{\mathcal{T}_l(Y_{l,J}^g) + \mathcal{T}_k(Y_{k,J}) - \mathcal{T}_c(Y_J^g) - \mathcal{T}_m(Y_J^g)}{P_J} \tag{19}$$

where $b_J(z_g)$ is the real pension benefit, $Y_{l,J}^g = P_J b_J(z_g)$ is the corresponding nominal pension income, and $Y_J^g = Y_{l,J}^g + Y_{k,J}$ is total nominal income.

Couple Formally, the dynamic problem of the retired couple is given by

$$R_J^c(a_J, z_m, z_f) = \max_{c_J, a_{J+1}} u(v(\tilde{P}_J, c_J), 1) + u(v(\tilde{P}_J, c_J), 1) + \phi(a_{J+1}) \tag{20}$$

$$\text{s.t.} \quad c_J + a_{J+1} = q_J a_J + b_J(z_m) + b_J(z_f) - \frac{\mathcal{T}_l(Y_{l,J}^c) + \mathcal{T}_k(Y_{k,J}) - \mathcal{T}_c(Y_J^c) - \mathcal{T}_m(Y_J^c)}{P_J} \tag{21}$$

where $Y_{l,J}^c = P_J[b_J(z_m) + b_J(z_f)]$ is nominal pension income and $Y_J^c = Y_{l,J}^c + Y_{k,J}$ is total nominal income.

A.1.2 Retirement: $j = J - 1 : W + 1$

Retired individuals do not work and do not have children. Singles face gender-specific survival risk, while retired couples may transition into widowhood after the death of one spouse. Let $R_j^m(a_j, z_m)$, $R_j^f(a_j, z_f)$ and $R_j^c(a_j, z_m, z_f)$ denote the value functions of a retired single male, a retired single female, and a retired couple, respectively.

Single males and females Formally, the dynamic problem of a single retired individual of gender g is given by

$$R_j^g(a_j, z_g) = \max_{c_j, a_{j+1}} u(v(\tilde{P}_j, c_j), 1) + \beta \left[s_{j+1}^g R_{j+1}^g(a_{j+1}, z_g) + (1 - s_{j+1}^g)\phi(a_{j+1}) \right] \tag{22}$$

$$\text{s.t.} \quad c_j + a_{j+1} = q_j a_j + b_j(z_g) - \frac{\mathcal{T}_l(Y_{l,j}^g) + \mathcal{T}_k(Y_{k,j}) - \mathcal{T}_c(Y_j^g) - \mathcal{T}_m(Y_j^g)}{P_j} \tag{23}$$

where $Y_{l,j}^g = P_j b_j(z_g)$, $Y_j^g = Y_{l,j}^g + Y_{k,j}$, and s_{j+1}^g is the probability that an individual of gender g survives to age $j + 1$, conditional on being alive at age j.

Couple Formally, the dynamic problem of the retired couple is given by

$$R_j^c(a_j, z_m, z_f) = \max_{c_j, a_{j+1}} u(v(\tilde{P}_j, c_j), 1) + u(v(\tilde{P}_j, c_j), 1) + \beta \Big[s_{j+1}^m s_{j+1}^f R_{j+1}^c(a_{j+1}, z_m, z_f) + (1 - s_{j+1}^f) s_{j+1}^m R_{j+1}^m(a_{j+1}, z_m) + s_{j+1}^f (1 - s_{j+1}^m) R_{j+1}^f(a_{j+1}, z_f) + (1 - s_{j+1}^m)(1 - s_{j+1}^f) \phi(a_{j+1}) \Big] \tag{24}$$

$$\text{s.t.} \quad c_j + a_{j+1} = q_j a_j + b_j(z_m) + b_j(z_f) - \frac{\mathcal{T}_l(Y_{l,j}^c) + \mathcal{T}_k(Y_{k,j}) - \mathcal{T}_c(Y_j^c) - \mathcal{T}_m(Y_j^c)}{P_j} \tag{25}$$

where $Y_{l,j}^c = P_j[b_j(z_m) + b_j(z_f)]$, $Y_j^c = Y_{l,j}^c + Y_{k,j}$, and s_{j+1}^g is defined above.

A.1.3 Last working period: $j = W$

Below, we describe the dynamic problem in the last working period for single males, single females, and couples. Let $V_j^m(a_j, z_m)$ denote the value function of a single male of age j, $V_j^f(a_j, z_f, n_j)$ the value function of a single female of age j, and $V_j^c(a_j, z_m, z_f, n_j)$ the value function of a couple of age j. For women, leisure is given by $1 - h_j - \mathbf{1}_{h_j>0}\Psi_j$, where the fixed work cost Ψ_j stands for the object defined in the main text for the relevant household type.

Single male Formally, the dynamic problem of a single man is given by

$$V_W^m(a_W, z_m) = \max_{c_W, a_{W+1}} u(v(\tilde{P}_W, c_W), 1 - \bar{h}) + \beta R_{W+1}^m(a_{W+1}, z_m) \tag{26}$$

$$\text{s.t.} \quad c_W + a_{W+1} = q_W a_W + y_{m,l,W} - \frac{\mathcal{T}_l(Y_{m,l,W}) + \mathcal{T}_k(Y_{k,W}) - \mathcal{T}_c(Y_W^m) - \mathcal{T}_m(Y_W^m)}{P_W} \tag{27}$$

where $Y_{m,l,W} = P_W y_{m,l,W}$ and $Y_W^m = Y_{m,l,W} + Y_{k,W}$.

Single female Formally, the dynamic problem of a single female is given by

$$V_W^f(a_W, z_f, n_W) = \max_{c_W, h_W, a_{W+1}} u(v(\tilde{P}_W, c_W), 1 - h_W - \mathbf{1}_{h_W>0}\Psi_W^f) + \beta R_{W+1}^f(a_{W+1}, z_f) \tag{28}$$

$$\text{s.t.} \quad c_W + a_{W+1} = q_W a_W + y_{f,l,W}(h_W) - \frac{\mathcal{T}_l(Y_{f,l,W}) + \mathcal{T}_k(Y_{k,W}) - \mathcal{T}_c(Y_W^f) - \mathcal{T}_m(Y_W^f)}{P_W} \tag{29}$$

where $h_W \in \{0, \bar{h}\}$, $Y_{f,l,W} = P_W y_{f,l,W}(h_W)$, and $Y_W^f = Y_{f,l,W} + Y_{k,W}$.

Couple Formally, the dynamic problem of the couple is given by

$$V_W^c(a_W, z_m, z_f, n_W) = \max_{c_W, h_W, a_{W+1}} u(v(\tilde{P}_W, c_W), 1 - \bar{h}) + u(v(\tilde{P}_W, c_W), 1 - h_W - \mathbf{1}_{h_W>0}\Psi_W^c)$$
$$+ \beta \Big[s_{W+1}^m s_{W+1}^f R_{W+1}^c(a_{W+1}, z_m, z_f) + (1 - s_{W+1}^f) s_{W+1}^m R_{W+1}^m(a_{W+1}, z_m) + s_{W+1}^f (1 - s_{W+1}^m) R_{W+1}^f(a_W \tag{30}$$

$$\text{s.t.} \quad c_W + a_{W+1} = q_W a_W + y_{m,l,W} + y_{f,l,W}(h_W) - \frac{\mathcal{T}_l(Y_{l,W}^c) + \mathcal{T}_k(Y_{k,W}) - \mathcal{T}_c(Y_W^c) - \mathcal{T}_m(Y_W^c)}{P_W} \tag{31}$$

where $h_W \in \{0, \bar{h}\}$, $Y_{l,W}^c = P_W[y_{m,l,W} + y_{f,l,W}(h_W)]$, and $Y_W^c = Y_{l,W}^c + Y_{k,W}$.

A.1.4 Working life: $j = W - 1 : 1$

The working-age problems before retirement are analogous, except that labor productivity and fertility continue to evolve stochastically.

Single male Formally, the dynamic problem of a single man is given by

$$V_j^m(a_j, z_m) = \max_{c_j, a_{j+1}} u(v(\tilde{P}_j, c_j), 1 - \bar{h}) + \beta \mathbb{E}_j V_{j+1}^m(a_{j+1}, z_{m,j+1}) \tag{32}$$

$$\text{s.t.} \quad c_j + a_{j+1} = q_j a_j + y_{m,l,j} - \frac{\mathcal{T}_l(Y_{m,l,j}) + \mathcal{T}_k(Y_{k,j}) - \mathcal{T}_c(Y_j^m) - \mathcal{T}_m(Y_j^m)}{P_j} \tag{33}$$

where $Y_{m,l,j} = P_j y_{m,l,j}$ and $Y_j^m = Y_{m,l,j} + Y_{k,j}$.

Single female Formally, the dynamic problem of a single female is given by

$$V_j^f(a_j, z_f, n_j) = \max_{c_j, h_j, a_{j+1}} u(v(\tilde{P}_j, c_j), 1 - h_j - \mathbf{1}_{h_j>0}\Psi_j^f) + \beta \mathbb{E}_j V_{j+1}^f(a_{j+1}, z_{f,j+1}, n_{j+1}) \tag{34}$$

$$\text{s.t.} \quad c_j + a_{j+1} = q_j a_j + y_{f,l,j}(h_j) - \frac{\mathcal{T}_l(Y_{f,l,j}) + \mathcal{T}_k(Y_{k,j}) - \mathcal{T}_c(Y_j^f) - \mathcal{T}_m(Y_j^f)}{P_j} \tag{35}$$

where $h_j \in \{0, \bar{h}\}$, $Y_{f,l,j} = P_j y_{f,l,j}(h_j)$, and $Y_j^f = Y_{f,l,j} + Y_{k,j}$.

Couple Formally, the dynamic problem of the couple is given by

$$V_j^c(a_j, z_m, z_f, n_j) = \max_{c_j, h_j, a_{j+1}} u(v(\tilde{P}_j, c_j), 1 - \bar{h}) + u(v(\tilde{P}_j, c_j), 1 - h_j - \mathbf{1}_{h_j>0}\Psi_j^c) + \beta \mathbb{E}_j V_{j+1}^c(a_{j+1}, z_{m,j+1}, z_{f,j+1}, n_{j+1}) \tag{36}$$

$$\text{s.t.} \quad c_j + a_{j+1} = q_j a_j + y_{m,l,j} + y_{f,l,j}(h_j) - \frac{\mathcal{T}_l(Y_{l,j}^c) + \mathcal{T}_k(Y_{k,j}) - \mathcal{T}_c(Y_j^c) - \mathcal{T}_m(Y_j^c)}{P_j} \tag{37}$$

where $h_j \in \{0, \bar{h}\}$, $Y_{l,j}^c = P_j[y_{m,l,j} + y_{f,l,j}(h_j)]$, and $Y_j^c = Y_{l,j}^c + Y_{k,j}$.

A.2 Computational Method

We solve the model in discrete time over a finite life cycle with $J = 61$ periods and retirement after period $W = 40$. Households are heterogeneous by family type (single men, single women, couples), education, idiosyncratic earnings, assets, age, and, for single females and couples, the number of children. Assets are discretized on a finite non-uniform allowing for both negative and positive positions. Female labor supply is discrete, with a two-point hours grid (that represents working and not working). Idiosyncratic earnings processes are approximated by finite-state Markov chains using Tauchen's method separately by gender and education. The number of children is stochastic and also follows an age-dependent Markov chain.

At each state, the household chooses next-period assets and, where relevant, female labor supply. Given total expenditure, intratemporal expenditure shares across consumption categories are recovered analytically from the estimated non-homothetic demand system. Taxes, transfers, pension income, and social-security

contributions enter the period budget constraint directly. We solve the model in Julia on the GPU using CUDA.

We compute the stationary cross-sectional distribution by direct simulation of the model-implied law of motion over the discrete state space. Starting from the initial distribution of newborn households across education, earnings, children, and assets, we propagate mass forward age by age using the optimal policy rules and the exogenous transition matrices for idiosyncratic earnings and family composition. We do this both for the stationary steady-state distribution as well as the transition experiments.

We evaluate the welfare using consumption-equivalent variation (CEV) for everyone alive at the time of the reform. For each inflation experiment, we compute the value functions over transition at the initial reform date and compare it to baseline value functions obtained under multiplicative scaling of steady-state consumption at each state space. The implied average scaling factor is interpreted as the welfare cost or gain of the reform.

B Additional Empirical Discipline and Quantitative Fit

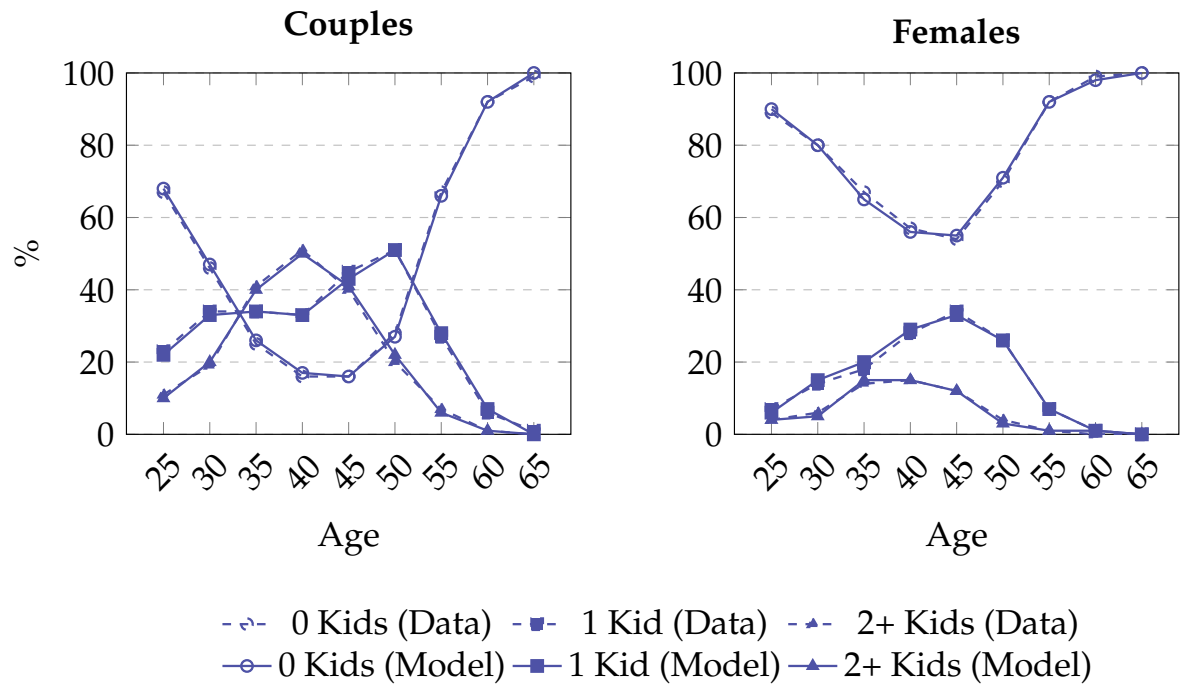
For the sake of brevity, the main paper leaves out many interesting figures and tables that complement the description of the empirical exercise presented in Section 3. This appendix collects and brifly descibes these exibits.

B.1 Children and Household Composition

In the model, children arrive stochastically, with arrival rates that differ by household type, namely single females and couples. We further assume that children arrive every five years, consistent with the structure of the Spanish Household Budget Survey. To discipline this process, we estimate age- and type-specific transition matrices so that the model matches the observed shares of households with zero, one, and two or more children in the data. Figure B.1 compares the simulated and empirical profiles.

As expected given this estimation strategy, the fit is very close. For both couples and single females, the model reproduces almost exactly the age profiles of households by number of children. It captures well both the higher prevalence of children among couples and the decline in the share of children living in the household at older ages. This close correspondence confirms that the calibrated transition process

Figure B.1: Share of Children by Household Type



Note: Author's own calculations based on the Spanish Household Budget Survey, 2006–2019.

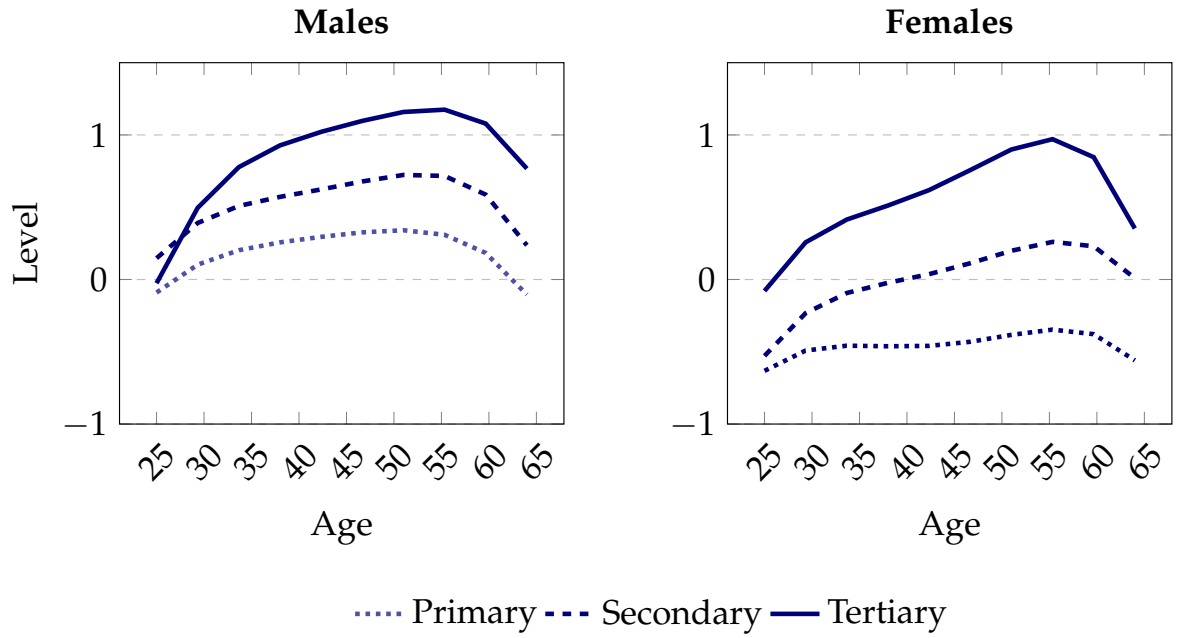
provides an accurate representation of household composition over the life cycle.

B.2 Additional Validation of the Earnings Process

This subsection provides additional evidence on the empirical performance of the estimated earnings process. Figure B.2 reports the deterministic component of earnings by gender and education, while Table B.1 compares model-implied and empirical dispersion moments across demographic groups and age brackets.

Figure B.2 shows that the deterministic component of earnings follows the standard inverted U-shape over the life cycle for all gender-education groups. Earnings rise at younger ages, reach a peak in mid-career, and then decline toward the end of working life. The figure also highlights a clear education gradient. For both men and women, higher educational attainment is associated with steeper earnings growth and higher deterministic earnings levels over most of the life cycle. This pattern is especially pronounced among men, for whom tertiary-educated workers display both faster early-career growth and higher peak earnings than workers with primary or secondary education. Among women, the same ranking by education is present, although the profiles are shifted downward relative to those of men, indicating persistent gender differences in deterministic earnings levels within each

Figure B.2: Deterministic Earnings Profiles by Gender and Education Level



Note: Author's own calculations based on the Spanish Living Conditions Survey, 2008–2019. A model unit is equivalent to EUR 10,000 in 2019 prices.

education group.

Table B.1 evaluates the extent to which the model reproduces the cross-sectional dispersion of earnings observed in the data. Overall, the fit is good. The model matches closely the p90/p10 ratios across gender, education, and age groups, capturing both the higher dispersion observed among women and the decline in upper-tail inequality with education. The fit is particularly strong for female workers, for whom the model-implied p90/p10 ratios are nearly identical to their empirical counterparts in both age groups. For male workers, the model also tracks the data well, with only small discrepancies across education categories.

The model also performs reasonably well in matching interquartile dispersion, as measured by the p75/p25 ratio. Although it tends to somewhat overpredict this moment in several cells, especially for men and for women with secondary or tertiary education, the deviations remain modest relative to the overall level of dispersion. Taken together, the evidence in Figure B.2 and Table B.1 indicates that the estimated earnings process provides a credible representation of both the deterministic life-cycle profile of earnings and the main dimensions of within-group earnings inequality in the data.

Table B.1: Estimated Earnings Moments by Gender and Education Level, Model vs. Data

Moment	Males					
	Primary		Secondary		Tertiary	
	Data	Model	Data	Model	Data	Model
p90/p10 (ages 25 - 34)	7.72	7.06	5.84	5.85	5.71	5.98
p75/p25 (ages 25 - 34)	2.46	2.78	2.20	2.52	2.18	2.44
p90/p10 (ages 40 - 49)	6.71	6.29	5.50	5.68	5.33	5.29
p75/p25 (ages 40 - 49)	2.16	2.55	2.14	2.46	2.23	2.36
Moment	**Females**					
	Primary		**Secondary**		**Tertiary**	
	Data	Model	Data	Model	Data	Model
p90/p10 (ages 25 - 34)	12.29	12.01	9.39	9.19	6.86	7.02
p75/p25 (ages 25 - 34)	3.39	3.55	2.72	3.27	2.59	2.88
p90/p10 (ages 40 - 49)	12.76	12.75	9.35	9.26	6.86	6.95
p75/p25 (ages 40 - 49)	3.72	3.62	2.79	3.12	2.59	2.85

Note: Author's own calculations based on the Spanish Living Conditions Survey, 2008–2019.

B.3 Other Exogenously Set Parameters

As described in the main text, Table B.2 reports the parameters set directly from institutional information, previous estimates, or direct observation.

B.4 Additional SMM Fit

As described in the main text, our SMM procedure targets the life-cycle profile of consumption, the ratio of nominal net position to income by education at ages 35 and 65, and female labor-force participation by education and marital status. The total number of moments is around 137 and in the estimation procedure, moments are weighted by the identity matrix, as it is standard in the literature, e.g., Heathcote et al. (2014). Figure B.4 and Figure B.3 report the fit objects moved out of the main text.

Figure B.3 shows that the model matches the main life-cycle patterns in female labor-force participation reasonably well across education and marital-status groups. In particular, it reproduces the strong education gradient in participation, with tertiary-educated women working more than secondary- and primary-educated women through-

Table B.2: Exogenously Set Parameters

Parameter	Value	Source
Preferences and Prices		
σ (Risk Aversion)	2.00	Standard value
R (Nominal Rate)	0.02	Mean ECB rate (2021 onward)
Consumption Taxes (VAT)		
τ_s (super-reduced)	0.04	Spanish VAT schedule
τ_r (reduced)	0.10	Spanish VAT schedule
τ_g (general)	0.21	Spanish VAT schedule
τ_e (energy)	0.21	Spanish VAT schedule
τ_f (food)	0.08	Implied weighted rate
Labor Income Tax		
λ_l (Level)	0.88	Carrillo and Ramos (2024)
τ_l (Progressivity)	0.16	Carrillo and Ramos (2024)
$\bar{Y}_l$ (avg. labor income)	2.80	Household survey data
$\tilde{Y}_l$ (threshold)	0.58	Carrillo and Ramos (2024)
Capital Income Tax		
α_k	0.12	Carrillo and Ramos (2024)
ζ_k	0.01	Carrillo and Ramos (2024)
κ_k	0.19	Carrillo and Ramos (2024)
$\bar{Y}_k$ (avg. capital income)	0.15	Household survey data
$\tilde{Y}_k$ (threshold)	6.08	Carrillo and Ramos (2024)
Tax Credit Function		
β_{0c}	0.01	Carrillo and Ramos (2024)
β_{1c}	0.01	Carrillo and Ramos (2024)
γ_c	-0.82	Carrillo and Ramos (2024)
Means-Tested Benefit		
g_0	0.05	Guner et al. (2020)
g_1	0.02	Guner et al. (2020)
g_2	-0.01	Guner et al. (2020)

Note: Where applicable, units correspond to EUR 10,000.

out the life cycle, and it also captures the systematic differences between singles and couples. The fit is generally stronger at middle and older ages, while some discrepancies remain at younger ages, especially for single women, for whom the model tends to underpredict participation. Even so, the model tracks well the broad decline in participation over the life cycle and the cross-sectional ranking across groups, which are the main moments relevant for the welfare analysis.

Figure B.4 shows that the model also provides a good fit to the life-cycle profile of consumption. It reproduces the hump-shaped pattern observed in the data, with consumption rising from young ages to middle age and declining thereafter. The model slightly understates consumption at younger ages and somewhat overstates it at older ages, implying a somewhat flatter profile than in the data, but it captures closely both the timing of the peak and the overall magnitude of consumption over the life cycle. Overall, the fit is sufficiently close to support the model's use for the quantitative welfare analysis.

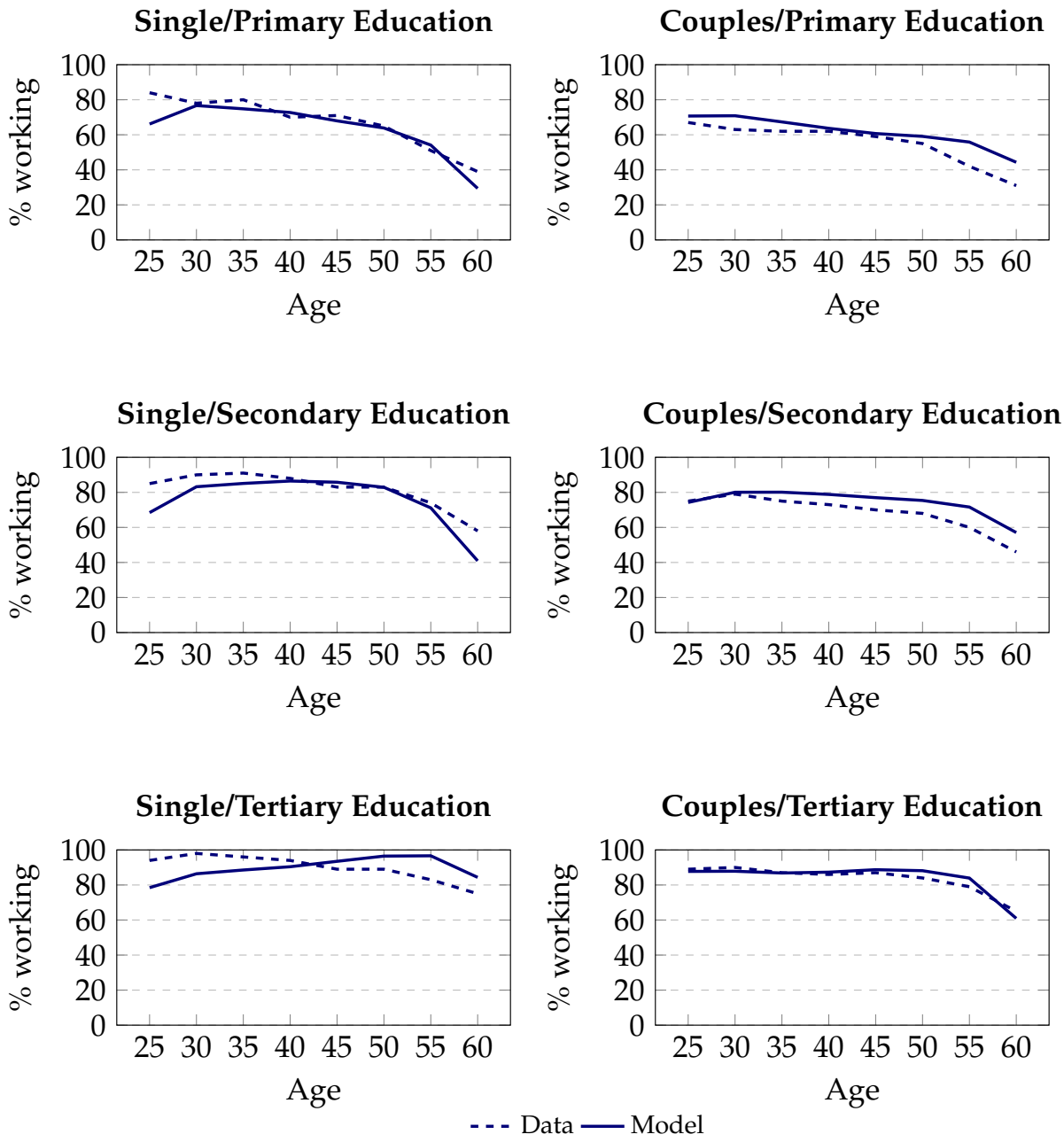
B.5 Untargeted Earnings Moments

Table B.3 reports untargeted earnings-dispersion moments by gender, education, and age. Overall, the model captures the main cross-sectional patterns in the data reasonably well, despite these moments not being directly targeted in estimation. In particular, it reproduces the higher level of earnings dispersion among women relative to men and the broadly lower dispersion among more educated workers.

The fit is strongest for p90/p10 ratios over ages 25–64, especially for women and for tertiary-educated men, where model and data are very close. For p75/p25 ratios, the model generally overpredicts dispersion, particularly for men with primary and secondary education and for women with secondary and tertiary education. At older ages, the model continues to match several moments well, but it tends to understate upper-tail dispersion, especially for men and women with primary education and for tertiary-educated men.

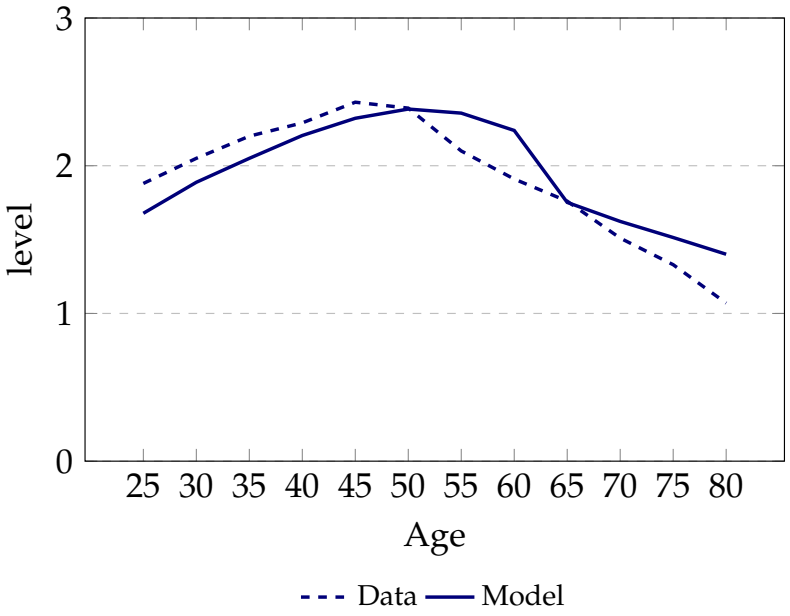
Taken together, these untargeted moments suggest that the estimated earnings process captures well the broad ranking of earnings inequality across demographic groups, while being somewhat less precise in matching the exact magnitude of dispersion, particularly in the middle of the distribution and at older ages.

Figure B.3: Labor Force Participation for Women



Note: Data moments are author's own calculations based on the Spanish Living Conditions Survey, 2008–2019.

Figure B.4: Consumption



Note: Data moments are author's own calculations based on the Spanish Household Budget Survey, 2006–2019.

Table B.3: Untargeted Earnings Moments by Gender and Education Level

Moment	**Males**					
	Primary		**Secondary**		**Tertiary**	
	Data	Model	Data	Model	Data	Model
p90/p10 (ages 25 - 64)	8.55	9.23	5.98	7.60	6.05	6.15
p75/p25 (ages 25 - 64)	2.42	3.68	2.26	3.27	2.33	2.71
p90/p10 (ages 55 - 64)	12.43	9.01	8.64	7.55	9.12	5.73
p75/p25 (ages 55 - 64)	3.25	3.34	2.63	3.09	2.68	2.55
Moment	**Females**					
	Primary		**Secondary**		**Tertiary**	
	Data	Model	Data	Model	Data	Model
p90/p10 (ages 25 - 64)	14.07	14.13	9.47	10.77	7.56	7.96
p75/p25 (ages 25 - 64)	3.76	4.10	2.83	3.59	2.74	3.42
p90/p10 (ages 55 - 64)	17.14	14.40	10.11	10.04	8.78	7.96
p75/p25 (ages 55 - 64)	4.01	4.05	2.84	3.38	2.49	3.14

Note: Author's own calculations based on the Spanish Living Conditions Survey, 2008–2019.

C Robustness and Further Quantitative Results

C.1 Different Assumptions about Wage Growth

C.1.1 Full Recovery of Real Wages in 2028

In the benchmark transition, the observed nominal wage path implies that average real wages remain below their pre-crisis level after 2025. Since the real-income channel is an important source of welfare loss in the main text, it is useful to ask whether the results depend on treating this decline as persistent rather than temporary. To address this issue, we consider an alternative wage path in which real wages gradually recover after 2025 and return to their pre-crisis level by 2028. Figure C.1 illustrates this counterfactual.

Table C.1 shows that this alternative path lowers the overall welfare cost of the inflation episode under all policy regimes, as one would expect when labor income eventually recovers. In the no-policy benchmark, the aggregate welfare loss falls from 6.65% in the main text to 6.05%. Under VAT cuts it falls to 5.81%, and under the benefit expansion to 5.57%. Thus, the level of welfare losses is smaller, but the policy ranking is unchanged: the benefit expansion continues to dominate VAT relief, and by almost exactly the same margin as in the benchmark.

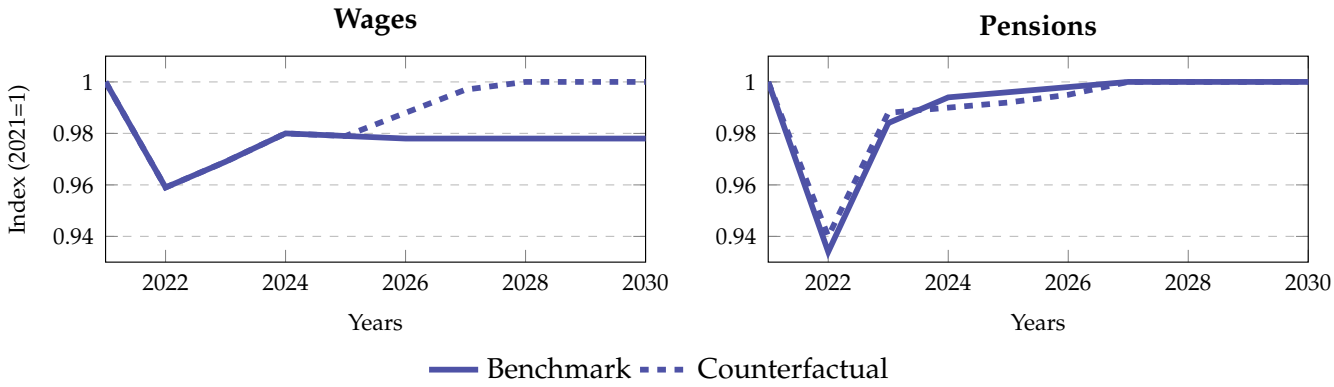
The decomposition in Table C.1 shows that the main effect of the alternative wage path operates through the real-income channel. Once wages are allowed to recover, the income-drop component becomes less severe, because households no longer face a permanent shortfall in purchasing power. By contrast, the relative-price channel is only modestly affected, since heterogeneous exposure to food and energy inflation comes from expenditure baskets rather than from the long-run wage assumption. The Fisher channel also remains quantitatively important, reflecting the fact that inflation still redistributes between nominal borrowers and savers even when labor income later recovers. Fiscal drag is likewise still present, because the inflation episode continues to interact with a tax-transfer system defined in nominal terms.

Overall, this robustness exercise shows that the benchmark wage assumption matters mainly for the level of welfare losses, not for the qualitative conclusions of the paper. A faster recovery in real wages makes the inflation episode less costly, but it does not overturn the basic mechanism or the policy comparison. VAT cuts still work mainly through necessity prices, whereas the benefit expansion still provides broader insurance against the dominant loss in disposable income.

Table C.1: Alternative Wage-Path: Full Recovery in 2028

	Benchmark	VAT Policy	Benefit Policy
Baseline	6.05	5.81	5.57
No Rel. Prices	5.76	5.37	5.27
No Inc. Drop	4.70	4.60	4.21
No Fisher Eff.	4.05	4.07	3.54
No Fiscal Drag	3.57	3.41	3.04

Figure C.1: Simulation of the Alternative Wage Path



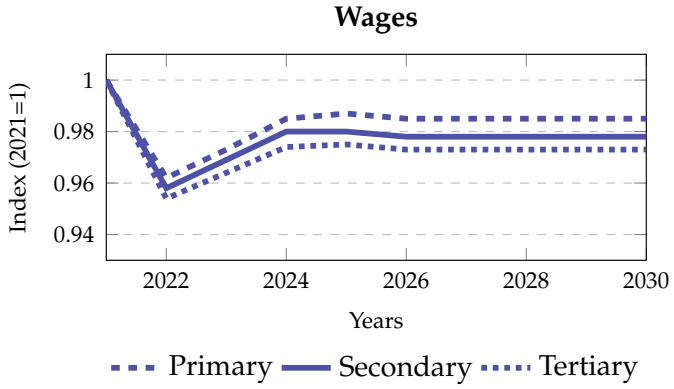
Note: Wages and pensions are all expressed in real terms.

C.1.2 Heterogeneus Nominal Wage Growth

As a robustness exercise, we allow wage adjustment during the inflation episode to differ across education groups. In the benchmark version of this exercise, we keep the wage path of the middle-education group unchanged and introduce modest deviations for the low- and high-education groups. We motivate this specification by evidence for Spain suggesting that wage compression at the lower end of the distribution was relatively strong during the recent inflation episode, partly reflecting institutional wage protection and minimum-wage increases, while high-wage workers were less shielded in relative terms, e.g. OECD (2025). Consistent with this evidence, we assume a slightly faster nominal wage recovery for the low-education group and a slightly slower recovery for the high-education group, while preserving the aggregate benchmark dynamics. This exercise allows us to assess whether our welfare results are sensitive to differential labor-income adjustment across education groups rather than to average wage dynamics alone. Figure C.2 illustrates this counterfactual.

Table C.2 shows that the results are broadly robust to allowing for differential wage adjustment by education. Relative to the benchmark with common wage dynamics, introducing a slightly faster wage recovery for the low-education group and a slightly slower recovery for the high-education group does not materially alter the main qualitative conclusions of the paper. The main effect is a modest reduction in welfare losses for low-education households, reflecting their stronger labor-income recovery during the inflation episode. This pattern is present both in the benchmark inflation experiment and in the policy counterfactuals, where the ranking and overall interpretation of the policy effects remain unchanged. Overall, the results suggest that our conclusions are not driven by the assumption of uniform wage growth across education groups, although heterogeneous wage adjustment somewhat attenuates the welfare costs borne by lower-education households.

Figure C.2: Simulation of the Heterogeneous Wage Path



Note: Wages are all expressed in real terms.

C.2 Further Results from the Policy Countefactuals

Tables C.3 and C.4 report the full group-level welfare decomposition for the two policy counterfactuals discussed in Section 4.2. They are the group-by-group counterpart of Panel B of Table 7 in the main text. As in the benchmark decomposition, the columns are constructed sequentially by shutting down one channel at a time, moving from the full policy environment to a specification without relative-price movements, then without the real-income decline, then without the Fisher channel, and finally without fiscal drag. The tables therefore make it possible to see not only which policy performs better overall, but also through which channels each instrument affects different household groups. This is useful because the two policies operate on different margins: VAT cuts compress necessity-price inflation, whereas

Table C.2: Heterogeneus Nominal Wage Growth

	Benchmark	**VAT Cuts**	**Benefit Expansion**
Aggregate	6.55	6.31	6.07
NNP:			
Borrowers	2.22	2.45	1.85
Savers	12.22	11.37	11.6
Income:			
Bottom 25%	6.40	6.28	5.31
Middle 50%	6.94	6.69	6.42
Top 25%	8.42	7.97	8.06
Age:			
25–44 Y	2.50	2.69	2.26
45–64 Y	3.07	3.19	2.77
65+ Y	18.20	16.75	17.07
Education:			
Primary	7.31	6.99	6.60
Secondary	6.75	6.35	6.38
Tertiary	5.18	5.16	5.01
Family:			
Single (M)	7.08	6.80	6.68
Single (F)	9.42	9.03	8.34
Couples	5.48	5.31	5.18
Fertility:			
No Children	8.36	7.94	7.76
1 Child	2.60	2.76	2.38
2+ Children	2.41	2.58	2.2

the transfer expansion leaves relative prices largely unchanged and instead supports disposable income directly.

Table C.3 shows that, under VAT cuts, the largest policy gains come from mitigating the relative-price channel. For all households, welfare losses fall from 6.41 in the benchmark VAT-cut economy to 5.93 once relative-price distortions are removed, implying that relative-price exposure remains the main residual source of welfare loss even under this policy. This is consistent with the interpretation in the main text: VAT cuts work primarily by compressing the inflation of food and energy, the categories that matter most for heterogeneous effective inflation rates. The table also shows clearly that this mechanism is especially relevant for retirees, low-income households, primary-educated households, single women, and households without children, i.e. the same groups that are more exposed to necessities in the benchmark allocation. By contrast, the contribution of fiscal drag is essentially nil throughout the table, with the final column close to zero in all cells. This confirms that VAT cuts do little to undo the broader nominal interaction between inflation and the tax-transfer system. The Fisher channel also remains important for incidence: savers continue to face large losses, while borrowers continue to benefit from liability erosion, although less so than in the no-policy benchmark. In this sense, Table C.3 reinforces the main-text conclusion that VAT cuts provide meaningful but narrow insurance, operating mainly through necessity prices and with gains tilted toward households whose exposure comes from consumption baskets and nominal asset holdings rather than from weak current income.

Table C.4 reveals a different structure. Under the benefit expansion, the dominant reduction in welfare losses comes from the real-income channel rather than from relative prices. For all households, welfare losses fall from 6.17 in the benchmark benefit-expansion economy to 3.92 once the income-drop channel is removed, whereas removing relative-price distortions only lowers losses to 5.87. This matches the mechanism described in Section 4.2.2: the transfer expansion does not materially compress inflation itself, but instead offsets its consequences for disposable income. The table shows that this feature matters especially for borrowers, the bottom income quartile, working-age households, single women, and households with children, namely those with limited self-insurance capacity and greater dependence on current cash flow. The fiscal-drag column is also markedly different from the VAT-cut case. The final entries are negative for all households and strongly negative for some groups, especially the bottom quartile, retirees, and single women. This reflects the fact that, once the inflation-related channels are stripped out, the transfer expan-

sion still leaves some households better off than under the benchmark because the policy itself raises net income. The Fisher channel remains quantitatively important as well, since inflation is not substantially reduced and the balance-sheet revaluation embedded in the benchmark is therefore largely preserved. Overall, Table C.4 makes transparent why the benefit expansion dominates VAT cuts in aggregate welfare terms: it provides insurance closer to the main source of damage in this episode, namely the erosion of real disposable income in a setting with incomplete markets, borrowing constraints, and imperfect indexation.

Taken together, Tables C.3 and C.4 clarify that the difference between the two instruments is not simply one of magnitude, but one of transmission. VAT cuts mainly attenuate the welfare losses associated with heterogeneous necessity inflation, while transfer expansions mainly attenuate losses associated with falling real disposable income and, through that channel, deliver broader protection to liquidity-constrained and lower-income households. This is exactly the distinction behind the main policy ranking in the paper.

Table C.3: Welfare Cost of the Inflation Surge under VAT Cuts

	Total	**- Rel. Prices**	**- Inc. Drop**	**- Fisher Eff.**	**- F. Drag**
All Households	6.41	5.93	4.12	2.34	0.00
NNP:					
Borrowers	2.60	2.09	0.49	2.33	0.00
Savers	11.39	10.95	8.87	2.36	0.00
Income:					
Inc. Bottom 25pc	6.39	5.66	3.33	3.33	0.00
Inc. Middle 50pc	6.79	6.27	4.43	2.36	0.00
Inc. Top 25pc	8.05	7.70	6.06	2.12	0.00
Age:					
25–44 Years Old	2.84	2.42	0.84	1.91	0.00
45–64 Years Old	3.29	2.84	1.85	2.43	0.00
65+ Years Old	16.75	16.12	12.81	2.94	0.00
Education:					
Primary	7.31	6.56	4.48	2.51	0.00
Secondary	6.35	5.93	4.13	1.96	0.00
Tertiary	4.95	4.87	3.53	2.27	0.00
Family:					
Single (M)	6.88	6.54	4.49	1.59	0.00
Single (F)	9.15	8.34	6.35	3.57	0.00
Couples	5.40	4.99	3.31	2.11	0.00
Fertility:					
No Children	8.02	7.51	5.53	2.47	0.00
1 Child	2.90	2.47	1.11	2.11	0.00
2+ Children	2.72	2.29	0.83	1.98	0.00

Table C.4: Welfare Cost of the Inflation Surge under Benefit Expansion

	Total	- Rel. Prices	- Inc. Drop	- Fisher Eff.	- F. Drag
All Households	6.17	5.87	3.92	1.84	-0.63
NNP:					
Borrowers	2.00	1.71	-0.06	1.94	-0.51
Savers	11.62	11.32	9.11	1.72	-0.79
Income:					
Inc. Bottom 25pc	5.42	4.83	2.28	2.03	-1.61
Inc. Middle 50pc	6.52	6.18	4.22	1.81	-0.69
Inc. Top 25pc	8.00	8.00	6.27	1.73	-0.50
Age:					
25–44 Years Old	2.42	2.22	0.53	1.68	-0.30
45–64 Years Old	2.86	2.65	1.53	2.16	-0.34
65+ Years Old	17.07	16.49	12.94	1.67	-1.60
Education:					
Primary	6.91	6.31	4.06	1.71	-0.99
Secondary	6.38	6.16	4.14	1.69	-0.37
Tertiary	4.80	4.97	3.54	2.15	-0.20
Family:					
Single (M)	6.76	6.64	4.62	1.25	-0.43
Single (F)	8.45	7.78	5.57	2.18	-1.68
Couples	5.28	5.06	3.21	1.87	-0.34
Fertility:					
No Children	7.84	7.50	5.36	1.84	-0.79
1 Child	2.51	2.32	0.82	1.90	-0.28
2+ Children	2.35	2.13	0.54	1.79	-0.27

C.3 Different Order

Table C.5 shows that the welfare decomposition in the laissez-faire benchmark is robust to the ordering in which channels are shut down. In this alternative decomposition, we remove the Fisher channel first, then the real-income decline, then fiscal drag, and only at the end the relative-price component of inflation. Because the model is non-linear, exact order invariance is not to be expected. Nonetheless, the quantitative conclusions are remarkably similar to those in Table 4. At the aggregate level, the Fisher channel accounts for 2.00 percentage points of the total welfare loss, the income-drop channel for 1.96 points, fiscal drag for 2.41 points, and relative prices for just 0.28 points. These numbers are nearly identical to those in Table 4, where the corresponding contributions are 2.02, 1.94, 2.39, and 0.30 percentage points. The main message is therefore unchanged: the welfare cost of the inflation

surge is driven primarily by nominal-income erosion, balance-sheet redistribution, and fiscal drag, while the relative-price channel is quantitatively smaller in the aggregate.

The same robustness holds across household groups. Borrowers still benefit strongly from Fisher redistribution: removing the Fisher channel first raises their welfare loss from 2.37 to 4.40, almost exactly mirroring the benchmark ordering. Savers, by contrast, continue to bear large Fisher losses, with welfare costs falling from 12.24 to 4.99 once that channel is shut down. Likewise, the role of fiscal drag remains especially large for groups that are more exposed to the nominal tax-transfer system, including the bottom quartile, retirees, and single women. Finally, shutting down relative prices last still reduces welfare losses only modestly in the aggregate, but more noticeably for groups with high expenditure shares on necessities, such as retirees, poorer households, and single women. In other words, the alternative ordering preserves both the ranking of mechanisms and the cross-sectional incidence patterns emphasized in the discussion of Table 4.

Taken together, Table C.5 confirms that our interpretation of the inflation episode does not hinge on a particular sequential ordering of the decomposition. Relative-price inflation remains an important component for understanding why some households are hit harder than others, but it is not the dominant source of aggregate welfare loss. The broader nominal channels are consistently the key drivers of the cost of inflation, and the ordering exercise simply reinforces that conclusion rather than overturning it.

Table C.5: Welfare Cost of the Inflation Surge. *Lasseiz-Faire* scenario. Alternative ordering or the welfare decomposition.

	Total	**- Fisher Eff.**	**- Inc. Drop**	**- F. Drag**	**- Rel. Prices**
All Households	6.65	4.65	2.69	0.28	0.00
NNP:					
Borrowers	2.37	4.40	2.67	0.28	0.00
Savers	12.24	4.99	2.73	0.29	0.00
Income:					
Inc. Bottom 25pc	6.51	6.42	4.01	0.61	0.00
Inc. Middle 50pc	7.04	4.75	2.76	0.33	0.00
Inc. Top 25pc	8.50	4.03	2.3	0.12	0.00
Age:					
25-44 Years Old	2.65	3.86	2.13	0.17	0.00
45-64 Years Old	3.16	3.81	2.68	0.19	0.00
65+ Years Old	18.2	7.14	3.65	0.60	0.00
Education:					
Primary	7.62	5.52	3.2	0.63	0.00
Secondary	6.75	4.04	2.21	0.18	0.00
Tertiary	4.97	3.55	2.12	-0.23	0.00
Family:					
Single Males	7.16	3.70	1.73	0.08	0.00
Single Females	9.53	6.58	4.35	0.73	0.00
Couples	5.58	4.24	2.37	0.18	0.00
Fertility:					
No Children	8.43	5.00	2.87	0.33	0.00
1 Child	2.74	3.86	2.34	0.18	0.00
2+ Children	2.56	3.86	2.24	0.20	0.00

BANCO DE ESPAÑA PUBLICATIONS

WORKING PAPERS

2530 MIGUEL ACOSTA-HENAO, MARÍA ALEJANDRA AMADO, MONTSERRAT MARTÍ and DAVID PÉREZ-REYNA: Heterogeneous UIPDs across Firms: Spillovers from U.S. Monetary Policy Shocks.
2531 LUIS HERRERA and JESÚS VÁZQUEZ: Learning from news.
2532 MORTEZA GHOMI, JOCHEN MANKART, RIGAS OIKONOMOU and ROMANOS PRIFTIS: Debt maturity and government spending multipliers.
2533 MARINA DIAKONOVA, CORINNA GHIRELLI and JAVIER J. PÉREZ: Political polarization in Europe.
2534 NICOLÁS FORTEZA and SERGIO PUENTE: Measuring non-workers' labor market attachment with machine learning.
2535 GERGELY GANICS and LLUC PUIG CODINA: Simple Tests for the Correct Specification of Conditional Predictive Densities.
2536 HENRIQUE S. BASSO and OMAR RACHEDI: Robot adoption and inflation dynamics.
2537 PABLO GARCIA, PASCAL JACQUINOT, ČRT LENARČIČ, KOSTAS MAVROMATIS, NIKI PAPADOPOULOU and EDGAR SILGADO-GÓMEZ: Green transition in the Euro area: domestic and global factors.
2538 MARÍA ALEJANDRA AMADO, CARLOS BURGA and JOSÉ E. GUTIÉRREZ: Cross-border spillovers of bank regulations: Evidence of a trade channel.
2539 ALEJANDRO CASADO and DAVID MARTÍNEZ-MIERA: Banks' specialization and private information.
2540 CHRISTIAN E. CASTRO, ÁNGEL ESTRADA GARCÍA and GONZALO FERNÁNDEZ DIONIS: Diversifying sovereign risk in the Euro area: empirical analysis of different policy proposals.
2541 RAFAEL GUNTIN and FEDERICO KOCHEN: The Origins of Top Firms.
2542 ÁLVARO FERNÁNDEZ-GALLARDO: Natural disasters, economic activity, and property insurance: evidence from weekly U.S. state-level data.
2543 JOSÉ ELÍAS GALLEGOS, ESTEBAN GARCÍA-MIRALLES, IVÁN KATARYNIUK and SUSANA PÁRRAGA RODRÍGUEZ: Fiscal Announcements and Households' Beliefs: Evidence from the Euro Area.
2544 LUIS HERRERA, MARA PIROVANO and VALERIO SCALONE: From risk to buffer: Calibrating the positive neutral CCyB rate.
2545 ESTEBAN GARCÍA-MIRALLES et al.: Fiscal drag in theory and in practice: A European perspective.
2546 TATSURO SENGA and IACOPO VAROTTO: Investment Irreversibility in a Granular World.
2547 OLYMPIA BOVER, NEZIH GUNER, YULIYA KULIKOVA, ALESSANDRO RUGGIERI and CARLOS SANZ: Family-friendly policies and fertility: What firms have to do with it?
2548 ADINA-ELENA FUDULACHE and MARIA DEL CARMEN CASTILLO LOZOYA: Demand drivers of central bank liquidity: A time-to-exit TLTRO analysis.
2549 ERIK ANDRES-ESCAYOLA, LUIS MOLINA, JAVIER J. PÉREZ and ELENA VIDAL: How economic policy uncertainty spreads across borders: the case of Latin America.
2550 MATTHIAS BURGERT, MATTHIEU DARRACQ PARIÈS, LUIGI DURAND, MARIO GONZÁLEZ, ROMANOS PRIFTIS, OKE RÖHE, MATTHIAS ROTTNER, EDGAR SILGADO-GÓMEZ, NIKOLAI STÄHLER and JANOS VARGA: Macroeconomic effects of carbon-intensive energy price changes: A model comparison.
2601 IACOPO VAROTTO: Blocking the Blockers? Diversity Matters.
2602 CARLOS CAÑIZARES MARTÍNEZ, ADRIANA LOJSCHOVÁ and ALICIA AGUILAR: Non-linear effects of monetary policy shocks on housing: Evidence from a CESEE country.
2603 DIEGO BONELLI: Inflation risk and yield spread changes.
2604 MARÍA ALEJANDRA AMADO: Macroprudential FX Regulations and Small Firms: Unintended Consequences for Credit Growth.
2605 FERNANDO ÁVALOS, BORIS HOFMANN and JOSE M. SERENA: Monetary policy and private equity acquisitions: tracing the links.
2606 RICARD GREBOL, MARGARITA MACHELETT, JAN STUHLER and ERNESTO VILLANUEVA: Assortative Mating, Inequality, and Rising Educational Mobility in Spain.
2607 PABLO AGUILAR, RUBÉN DOMÍNGUEZ-DÍAZ, JOSÉ-ELÍAS GALLEGOS and JAVIER QUINTANA: The Transmission of Foreign Shocks in a Networked Economy.
2608 ERWAN GAUTIER, CRISTINA CONFLITTI, DANIEL ENDERLE, LUDMILA FADEJEVA, ALEX GRIMAUD, EDUARDO GUTIÉRREZ, VALENTIN JOUVANCEAU, JAN-OLIVER MENZ, ALARI PAULUS, PAVLOS PETROULAS, PAU ROLDAN-BLANCO and ELISABETH WIELAND: Consumer price stickiness in the euro area during an inflation surge.
2609 MORTEZA GHOMI and SAMUEL HURTADO: RAUI: Uncertainty Indicators Built With Artificial Intelligence.
2610 MORTEZA GHOMI and EVI PAPPA: Stimulating avenues: EIB loans and returns to Public Investment.

2611 JUAN S. MORA-SANGUINETTI, CRISTINA PEÑASCO and ROK SPRUK: The impact of "Green Regulation" on firms' innovation.
2612 ÁLVARO FERNÁNDEZ-GALLARDO and EVI PAPPA: Natural disasters and fiscal shelters.
2613 NICOLÁS BONINO-GAYOSO and MÓNICA CORREA-LÓPEZ: Unexpecting the expected in real-time inflation forecasting: The inflation expectations channel?
2614 ANDRÉS AZQUETA-GAVALDÓN, MARINA DIAKONOVA, CORINNA GHIRELLI and JAVIER J. PÉREZ: Diverging signals from economic uncertainty measures: Uncovering coherence through news narratives.
2615 JOSÉ E. GUTIÉRREZ, ENRIC MARTORELL and MARIYA MELNYCHUK: The nexus between the deposit and risk-taking channels of monetary policy.
2616 MARTA GARCÍA-RODRÍGUEZ and CLEMENTE PINILLA-TORREMOCHA: The role of confidence measures in European unemployment dynamics.
2617 DANIEL DEJUAN-BITRIA: Processing forward-looking loan loss provisions: evidence from the adoption of the CECL model.
2618 RYAN BANERJEE, FRANCISCO GONZÁLEZ, JOSÉ E. GUTIÉRREZ and JOSE-MARÍA SERENA: Credit Supply in the Wake of Distressed Bank Acquisitions.
2619 ALEJANDRO CASADO, MARCO GIOMETTI, JOSÉ E. GUTIÉRREZ, DAVID MARTÍNEZ-MIERA, ALEXANDRA MATYUNINA and TAMMARO TERRACCIANO: Digitalization and credit markets: Evidence from e-Invoicing.
2620 JORGE ABAD, SAKI BIGIO, SALOMÓN GARCÍA-VILLEGAS, JOËL MARBET and GALO NUÑO: The Heterogeneous Bank Lending Channel of Monetary Policy.
2621 NICOLÁS FORTEZA and JOSÉ M. LABEAGA: Pollution, Density and Low Emission Zones: European Evidence.
2622 ANDREA DE POLIS, ÁLVARO FERNÁNDEZ-GALLARDO and JOSÉ NICOLÁS ROSAS: Oil supply shocks and inflation tail risks.
2623 LUIS HERRERA, CATERINA MENDICINO, KALIN NIKOLOV and VALERIO SCALONE: Monetary Tightening, Financial Stability and the Role of Macroprudential Policy.
2624 MARINA GÓMEZ-GARCÍA: The impact of air pollution on the housing market: The case of Madrid.
2625 ANA AGUILAR, RAFAEL GUERRA, CAROLA MÜLLER and ALEXANDRE TOMBINI: The macro-financial impact of economic policy uncertainty in Latin America.
2626 ANDREA DE POLIS, LEONARDO MELOSI and IVAN PETRELLA: The Taming of the Skew: Asymmetric Inflation Risk and Monetary Policy.
2627 EOGHAN O'NEILL and SOFIA VELASCO: Let the Tree Decide: FABART. A Non-parametric factor model for nonlinear oil shock transmission.
2628 CRAIG A. CHIKIS, JONATHAN GOLDBERG and DAVID LÓPEZ-SALIDO: The innovator's risk premium: Sticky hurdle rates, the cost of capital, and creative destruction.
2629 LUCAS TER STEEGE and SOFIA VELASCO: What volatility reveals: agnostic identification of exchange rate and Treasury-market dynamics in inconvenient times.
2630 CALLUM JONES, DAVID LÓPEZ-SALIDO and THOMAS PHILIPPON: Is growth additive?
2631 JACOB T. HESS and XUFENG WANG: Measuring Merger Effects with Revenue Data.
2632 PABLO AGUILAR, MATTHIEU DARRACQ PARIÈS, ALISTAIR DIEPPE, RUBÉN DOMÍNGUEZ-DÍAZ, ANTONIO EUGENELO, JOSÉ-ELÍAS GALLEGOS and JAVIER QUINTANA: Tariffs, production networks, and spillovers: the case of a US-China Trade War.
2633 LUCA BARBAGLIA, MARINA DIAKONOVA, LUIS DÍEZ-CATALÁN, CORINNA GHIRELLI, ALICE LIA, JAVIER J. PÉREZ and STEFANO VERZILLO: Moving Out: Geoeconomic Policy and the Relocation of Foreign Affiliates.
2634 IRINA BALTEANU, MAXIMILIANO MORENO and FRANCESCA VIANI: Flooded by China? Trade diversion due to US tariffs during Trump's first mandate.
2635 PIERLAURO LOPEZ, FRANCISCO VÁZQUEZ-GRANDE and DAVID LÓPEZ-SALIDO: A New Keynesian model of the term structures of equity and bond returns.
2636 MARINA DIAKONOVA, JULIA ESTEFANIA-FLORES, CORINNA GHIRELLI, ANA PEÑALOSA, JAVIER J. PÉREZ and AITANA SIMÓ: Political Polarization and Legislative Gridlock: A Comparative High-Frequency Approach.
2637 MARIO ALLOZA, RUBÉN DOMÍNGUEZ-DÍAZ, PAU DURÁ and IACOPO VAROTTO: The macroeconomic effects of defence expenditure: Evidence from Spain.
2638 SANTIAGO ALVAREZ-BLASER: Inflation and Price Dispersion: New Cross-Sectoral and International Evidence.
2639 DAVID CUBERES, AITOR LACUESTA, CARLOS MORENO-PÉREZ, and DANIEL OTO-PERALÍAS: Land concentration and large renewable energy projects.
2640 DANTE AMENGUAL and LLUC PUIG-CODINA: A Bayesian analysis of the Cox-Ingersoll-Ross model.
2641 JONATHAN GOLDBERG and DAVID LÓPEZ-SALIDO: Leaning without Sowing the Wind: Optimal Monetary Policy in Speculative Booms.
2642 MYROSLAV PIDKUYKO and RAFFAELE ROSSI: Fiscal Policy during the cost-of-living crisis.