ECB FORUM ON CENTRAL BANKING
30 June-2 July 2025

Adapting to change: macroeconomic shifts and policy responses

Discretionary spending is the cycle, and why it matters for monetary policy

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EUROPEAN CENTRAL BANK
EUROSYSTEM

Discretionary Spending is the Cycle, and Why it Matters for Monetary Policy

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Abstract

This paper develops a novel framework for business-cycle analysis in the Euro-area based on the distinction between necessity and discretionary spending as well as their associated industries. We apply our approach to quantify the heterogeneous effects of monetary policy, uncovering significant new regularities. Consumer spending, employment, corporate profits, stock returns and dividend payments exhibit greater cyclicality and greater sensitivity to monetary policy in discretionary industries, while prices respond more in sectors producing necessities. Wages, however, display limited sectoral asymmetry. Discretionary industries are characterized by a substantially higher concentration of hand-to-mouth workers, particularly among lower earners. Only consumer prices in necessity sectors are a significant leading indicator for GDP, whereas only employment rates in discretionary industries help predict HICP inflation. We show that a calibrated theoretical model with spending heterogeneity and labour market heterogeneity is consistent with these findings. We use the model to revisit the design of optimal monetary policy. We find that the European Central Bank should abandon headline inflation targeting and focus instead only on inflation in discretionary spending; doing so mitigates the adverse effects of recessions on hand-to-mouth workers and thus stabilizes Euro-area aggregate demand more effectively.

1 Introduction

Understanding the channels through which monetary policy transmits to household expenditure and savings decisions is central to effective monetary policymaking and our understanding of business-cycle fluctuations. Recent macroeconomic developments such as the European sovereign debt crisis of 2011-13 or the cost of living crisis of 2021-23, and structural shifts such as the great financial crisis of 2007-09 and the global pandemic of 2020-21, underscore the necessity of revisiting conventional frameworks with richer models that incorporate heterogeneity in consumer spending, financial constraints and sectoral labour dynamics. Our analysis directly addresses this need by examining the complex and heterogenous ways in which consumption inequality influences the transmission of monetary policy in the Euro-area. More specifically, we propose a framework that distinguish between discretionary and necessity spending, revealing its centrality towards a new way of re-thinking business-cycle fluctuations.

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[1] We are extremely grateful to Carlo Altavilla, Peter Karadi, Philipp Hartmann, Christian Höynck, Sara Holton, Simone Manganelli, Sebastian Schimdt, Elitsa Stefanova, Maria Antonietta Viola and Francesca Zucchi for their help in gaining access to some of the more granular data. Correspondence: Michele Andreolli, Caroll School of Management, Boston College, ; Natalie Rickard, London Business School, nrickard@london.edu; Paolo Surico, London Business School and CEPR, psurico@london.edu; Chiara Vergeat, London Business School, cvergeat@london.edu andreoll@bc.edu; Natalie Rickard, London Business School, nrickard@london.edu; Paolo Surico, London Business School and CEPR, psurico@london.edu; Chiara Vergeat, London Business School, cvergeat@london.edu

Necessity spending refers to the consumption of goods and services that households typically cannot easily postpone or reduce significantly without affecting their fundamental well-being and standards of living. In the economic jargon due to Engel (1857), these are goods and services whose budget share *decreases* with household income. Examples include housing, utilities, basic groceries, essential healthcare, transportation to work, and education. On the other hand, discretionary spending comprises goods and services that households can more easily delay or forego entirely without severely impacting their immediate needs. In other words, this is the portion of the consumption basket whose budget share *increases* with household income.[2] Common examples include dining out, entertainment events, travel, luxury apparel, vehicles, electronics, gym memberships, and other leisure activities.[3]

The distinction between these two categories of goods and services is critical, as the demand for necessity and discretionary goods and services as well as for the workers producing them respond differently to economic fluctuations and policy changes, influencing how monetary policy propagates through the rest of the economy. After a hike in the European Central Bank (ECB) policy rate, discretionary spending contracts significantly more than necessities. This triggers a fall in aggregate labour demand that is largely driven by discretionary industries. Importantly, these sectors employ a larger share of low-income, hand-to-mouth workers, whose consumption is highly sensitive to income fluctuations. Thus, the initial drop in discretionary spending cascades into a broader decline of aggregate demand, amplified by the second-round effects on low-income households' earnings and subsequently their consumption.

The prices of necessity goods and services in the Euro-area are significantly more volatile that the prices associated with discretionary spending, and their frequency of price adjustments is also higher than their discretionary counterpart. While wages are generally stickier than prices, we find little evidence of a sectoral asymmetry in workers' compensations. The sectoral price and wage dynamics implies that corporate profits are less-cyclical in necessity industries, and they actually grew during the cost of living crisis of 2021-23; in contrast, the profits of firms producing discretionary goods and services declined over this period. The latter are also the companies that experience a higher cyclicality of stock returns and dividend payments relative to firms in the necessity sectors.

Leading Indicators Analysis. To assess the dynamic correlations of our newly constructed time series for prices, consumption, employment, wages and stock returns in the discretionary and necessity sectors, we perform an otherwise standard leading indicator analysis in which we compare sectoral variables with their aggregate counterparts. Our main result is that the ability of aggregate prices to predict output in the Euro-area is entirely accounted for by the price sub-index of necessity goods and services, while the ability of the aggregate employment rate to predict inflation can be explained by movement in the employment rate of discretionary industries only. Finally, sectoral stock market returns tend to outperform the predictive ability of the aggregate Euro STOXX 600 index for both GDP and HICP.

Responses to Monetary Policy Shocks. To tell apart correlation from causation, we adopt the high-frequency identification proposed by Jarociński and Karadi (2020), who refine the strategy popularized by Gürkaynak et al. (2005) and Nakamura and Steinsson (2018) by purging the information effect associated with the ECB assessment of the economic outlook. This strategy exploits: (i) movements in the 3-months EONIA swap rate around tight windows of 30-minute around press statements and 90-minute around press conferences following the monetary policy meetings of the ECB governing council, (ii) the correlation between the EONIA rate and the Euro STOXX index. The intuition is that surprise movements in the interest swap rates over such a short time

[2] Throughout the paper, we use as synonimous necessities, essentials and basic goods and services, on the one hand, and discretionary, non-essentials and luxury goods and services, on the other hand.

[3] In practice, we follow the classification of discretionary and necessity spending published by the British Office for National Statistics (ONS) but we have verified that this largely overlaps with the classification proposed by Andreolli, Rickard and Surico (2024) on the basis of the Engel curve approach of Aguiar and Bils (2024), which exploits cross-sectional variation in individual category budget shares at the household level.

window are unlikely contaminated by other macroeconomic news, and that a positive correlation between policy rates and stock returns is unlikely to reflect a genuine monetary policy shock.

We estimate a Bayesian proxy-VAR for the Euro-area over the period 1999q1-2024q2, the longest available sample at the time of writing since the inception of the Euro. We use the same main variables as in Jarociński and Karadi (2020), including the German one-year government bond yield and the BBB bond spread, adding one sectoral variable at the time to avoid the curse of dimensionality. The impulse response analysis confirms by and large the unconditional correlations. After a contractionary monetary policy shock, consumption, employment, profits, stock returns and dividend payouts fall significantly more in discretionary industries, whereas prices respond more for necessity goods and services. In contrast, we find no statistical difference in the adjustment of wages across sectors after a change in the ECB policy rate.

The Design of Optimal monetary policy. To draw policy implications, we employ a model with non-homothetic preferences, hand-to-mouth consumers, nominal rigidities and uneven sectoral labour force composition that is consistent with our findings. We use this framework to derive optimal monetary policy predictions for the Euro-area; we compare these predictions to the normative implications from a standard multi-sectors model with neither heterogeneity in cyclical product demand (i.e. homothetic preferences) nor in labour demand (i.e. homogenous sectoral labour force composition). In the standard multi-sectors model, the optimal monetary policy assign to inflation in each sector a weight that is proportional to their consumption share, as in Woodford (2003). We label this result 'headline' inflation targeting.

We show, however, that introducing a more cyclical product demand for discretionary spending (through non-homothetic preferences) as well as a more cyclical labour demand in these industries (through heterogeneity in the labour force composition) strongly tilts the design of optimal monetary policy towards stabilising discretionary spending inflation. The intuition for this novel departure from headline inflation targeting is that in our framework, households have different elasticities of intertemporal substitution across spending categories. By targeting discretionary inflation, the central bank provides households with an incentive to smooth their discretionary spending; in turn, this ameliorates the negative employment effects on hand-to-mouth workers in discretionary industries and thus diminishes the associated second-round effects on consumption that would have otherwise emerged under headline inflation targeting.

Durables, Non-durables and Services. It is important to emphasize that the divide between discretionary and necessity is very distinct from the conventional consumption categorization into durables & semi-durables, non-durables and services. While most durable and semi-durable spending is discretionary, almost 40% of services are also discretionary, and services are a much larger portion of consumption. The corresponding share for discretionary non-durables among all non-durables is around 25%. In other words, Euro-area personal consumption expenditure comprises 9% of discretionary non-durable goods such as alcohol, tobacco, newspaper and books, 18% of discretionary services such as recreational and cultural services, hospitality and tertiary education, plus another 18% of durable and semi-durable goods, such as vehicle purchases, furniture and clothes, which also belong to discretionary spending, amounting to almost half of the consumption basket.

Re-interpreting the inflation cycle of 2021-2023. The distinction between discretionary and necessity spending allows us also to revise the dynamics of inflation during the recent cost of living crisis. Our analysis reveals that most of the inflation spike in 2022 was driven by price changes in necessity non-durable goods such as grocery, fuel and energy whereas the lion share of the 2023-25 persistence was mostly due to inflation in discretionary services. In contrast, we find little contribution to the dynamics of HICP inflation from the prices of discretionary non-durable (or durable) goods and the prices of necessity services such as healthcare, utilities and local transportation, despite these two groups represent 9% and 30% of Euro-area personal consumption expenditure, respectively.

Measurement. A significant contribution of this paper is the construction of a novel, comprehensive and granular dataset for the Euro-area designed to differentiate between necessity and discretionary economic activities. This dataset integrates various micro and macroeconomic sources, including household consumption and price data at the COICOP 3-digit level from Eurostat National Accounts, industry-level employment data from Eurostat's Labour Force Survey, detailed input-output tables, household-level information from the ECB Household Finance and Consumption Survey (HFCS), and firm-level financial data from Eikon. Our starting point is to adapt the UK Office for National Statistics (ONS) classification of necessity and discretionary goods to the COICOP framework, creating consistent quarterly series for both consumption and price indices.

Subsequently, we extend our classification to the production sector, utilizing Euro Area input-output tables following the methodology of Andreolli, Rickard, and Surico (2024) to distinguish intermediate industries whose outputs primarily feed into necessity or discretionary consumption. Employing this classification, we develop detailed quarterly employment series and employment rates. Additionally, we explore the distributional aspects of necessity and discretionary sectors by calculating the proportion of hand-to-mouth households employed in each sector across different income groups using HFCS data. The dataset further encompasses sector-specific equity indices derived from EURO STOXX 600 constituents, series for gross value added, operating surplus, wages, and compensation of employees from national accounts, as well as the frequency of price and wage adjustments in necessity and discretionary sectors, using our novel categorization based on the datasets for product prices from Gautier et al. (2024) and for wage negotiations from Botelho et al. (2025).

Our data construction carefully adheres to official statistical methodologies. This not only ensures the dataset consistency and comparability to Eurostat aggregate macroeconomic indicators, but also allow us to provide policy makers and academics with a new set of time series for consumption, prices, employment, wages, stock prices and dividends of necessity and discretionary sectors that can be readily integrated into policy analyses and academic research on monetary policy and business-cycle dynamics in the Euro Area.

Related literature. This paper contributes to an ever-growing literature initiated by the seminal contribution of Smets and Wouters (2007) and further inspired by the call for a research programme on monetary policy for Europe of Altavilla et. Al (2024). This line of important research seeks to provide new insights on European business-cycles and the transmission of monetary policy in the Euro-area using, among other strategies, the high-frequency identification proposed by Jarociński and Karadi (2020), and Altavilla et al. (2019). Relative to these analyses, we emphasize the critical role played by heterogeneity both in consumer spending *and* the labour market to alter the effects of the ECB monetary policy on aggregate variables such as inflation, consumption and employment.

A very influential empirical literature data has shown that household heterogeneity can significantly amplify the effects of monetary policy in the U.S. (Patterson, 2023, Andreolli et al. 2024), U.K. (Cloyne et al, 2023), Euro-area (Slacaleck et al., 2020; Rubbo et. Al, 2025), Norway (Holm et al., 2021), Sweden (Amberg, 2023) and Denmark (Andersen, 2024).[4] Another strand of research has emphasized other dimensions of heterogeneity across product quality (Jaimovich et al., 2019), durables and non-durables (Beraja and Wolf, 2024), lags of monetary policy (Buda et al., 2025), and nominal rigidities (Gautier et al., 2024, and Botelho et al., 2025). Relative to these earlier contributions, we emphasize another significant source of heterogeneity, namely the cyclical composition of both product and labour demand across necessity and discretionary sectors.

A significant body of research has sought to identify the best predictors for output and inflation. Seminal contributions for the U.S. and the Euro-area include Atkinson and Ohanian (2001), Stock and Watson (1999, 2003 and 2020), Forni et al. (2001 and 2003), Banerjee, Marcellino and Mosten (2005) and Jarociński and

[4] In Andreolli, Rickard and Surico (2024), we look at the U.S., focus on the interaction between the cyclical composition of product and labour demand across essential and non-essential sectors as a source of business-cycle amplification, and study how sectoral VATs stabilize aggregate demand more than consumer taxes uniformly applied to all goods and services. In this paper, in contrast, we document novel empirical regularities for the Euro-area using newly constructed time series for necessity and discretionary sectors, use these series to evaluate their ability to help predict inflation and output growth as well as shed lights on the cyclicality of operating surplus, and study the optimal monetary policy design.

Maćkowiak (2017), among many others. We add to this voluminous literature by showing that the prices of necessities and the employment rate in industries that produce discretionary goods and services are helpful leading indicators of the business cycle in the Euro-area.

Finally, our paper contributes to the infant literature on optimal monetary policy with household heterogeneity, exemplified by the pioneering work of Acharya et al. (2023), Bilbiie (2024), McKay and Wolf (2022), Bergman et al. (2024), and Olivi et al. (2025). While we share with these papers the emphasis on the impact of sectoral dynamics on aggregate welfare, we are distinctively focused on the extent to which spending and labour market cyclical composition across discretionary and necessity industries mark a departure from targeting headline inflation in favour of a much larger weight assigned to discretionary price changes. We also contribute to the literature on optimal monetary policy with sectoral heterogeneity as Aoki (2001), Woodford (2003), Benigno (2004), Guerrieri et al. (2021). But compared to these papers we show that even with symmetric shocks and symmetric price stickiness the central bank should target exclusively inflation in discretionary spending. The reason if that this the sector that not only faces a much larger drop in product demand during recessions but also employs a far higher share of hand-to-mouth workers.

Structure of the paper. The paper is organised around seven parts. In Section 2, we describe the data and measurement of spending, prices, employment, wages, operating surplus and stock returns in necessity and discretionary industries over time. Descriptive statistics of these new Euro-area time series are shown in Section 3, including the share of hand-to-mouth workers employed in the two groups of industries. This part also makes it clear that the necessity/discretionary divide is very different from the durable/non-durable and services categorization. In Section 4, we present our main results of pervasive sectoral heterogeneity in the responses of prices, consumption and employment (but not wages) to identified monetary policy shocks. A leading indicator analysis is summarized in section 5. In Section 6, we present a theoretical model consistent with our main empirical findings and use it to derive optimal monetary policy prescriptions for the European Central Bank in Section 7. Conclusions are summarized in Section 8 while the appendices contain detailed information on data sources and measurement as well as an extensive set of robustness checks.

2 Data and Measurement

This section outlines the construction of a rich dataset that distinguishes between necessity and discretionary economic activities across key macroeconomic dimensions. We begin by classifying consumption categories into necessity and discretionary goods, following the UK ONS framework and adapting it to Eurostat data. Using this classification, we construct annual and quarterly series of real consumption and prices for the Euro Area. We then extend the classification to the supply side by identifying industries that primarily produce necessity or discretionary goods, using input-output analysis and household final demand. This allows us to track differences between necessity and discretionary sectors across labour and financial markets. Based on this industry mapping, we construct quarterly series of employment and employment rates by category. We also show how workers across the income distribution are differentially exposed to these sectors in the Euro Area labour market, using household-level data from the ECB Household Finance and Consumption Survey (HFCS). Furthermore, we develop category-specific stock price and dividends indices using data from Eikon. Finally, we derive new series for gross value added, wages, and operating surplus in necessity and discretionary industries, using detailed national accounts data.

2.1 Consumption and prices

We classify consumption categories into necessity and discretionary goods based on the classification developed by the UK Office for National Statistics (ONS). While the ONS defines this classification at the COICOP 4-digit level, we can easily adapt it to Eurostat data (which are available at the 3-digit level) by assigning each 3-digit category according to the majority classification of its 4-digit components. This procedure yields a classification that closely aligns with the distinction between essential and non-essential goods proposed by Andreolli, Rickard, and Surico (2024), which in turn builds on the Engel curve-based methodology introduced by Aguiar and Bils (2015). Using this mapping, we construct annual chain-linked volume indices for necessity and discretionary consumption and prices in the Euro Area.

For consumption, we follow the methodology used by Eurostat to compile aggregate consumption series. We start with data from Eurostat's National Accounts, specifically the "Households Final Consumption by Purpose" dataset. For each year, we aggregate expenditures at current prices and at previous year prices across all categories classified as necessity and as discretionary, respectively. These aggregates are then used to construct chain-linked real consumption indices, with 2015 as the reference year.

To construct quarterly growth rates, we use national accounts data from the Italian and German statistical agencies, ISTAT and DESTATIS, which report household consumption at a quarterly frequency at the COICOP 2-digit level. We classify each 2-digit category as either necessity or discretionary based on the average share of necessity/discretionary expenditure within each category, calculated using the annual data over the full sample period from 1995 to 2022.

We then aggregate nominal consumption data across Italy and Germany within each classification group and construct chain-linked volume indices for the combined series. From these, we compute quarterly growth rates for necessity and discretionary consumption. Finally, we interpolate the Euro Area's annual growth rates using the corresponding quarterly growth rates from the aggregated Italian-German series, applying the methodology by Chow-Lin (1971). This procedure yields consistent quarterly, year-on-year real consumption growth series for necessity and discretionary goods in the Euro Area, aligned with the Eurostat methodology. While this procedure allows us to assess consumption cyclicality at a higher frequency, we emphasise that much of the cyclicality we describe in this section is also clear in the annual data, and not reliant on this interpolation procedure.

Detailed price data are available at a monthly frequency and at the COICOP 3-digit level in Eurostat, allowing us to directly apply the Eurostat methodology to construct HICP-like indices for necessity and discretionary goods. We collect monthly price data disaggregated at the COICOP 3-digit level, along with the corresponding HICP item weights required for aggregation, from Eurostat. To construct the aggregate indices, we first unchain the monthly category-level indices by dividing each series by its value in December of the previous year. We then compute unchained price indices for necessity and discretionary goods by weighting the unchained category-level indices with their respective item weights, rescaled to ensure consistency within the necessity and discretionary groups. Finally, we re-chain the aggregated series to obtain monthly chain-linked price indices for necessity and discretionary goods. The resulting indices are seasonally adjusted.

The final consumption and price indices for necessity and discretionary goods, constructed using this methodology, cover the sample periods 1997Q1–2024Q2 and 1998Q1–2024Q2, respectively. Further details on the construction of these series are provided in Section B2 of the appendix.

2.2 Identifying Industries that produce Necessity and Discretionary goods

Our goal is to provide a comprehensive picture of the discretionary-necessity divide. Accordingly, we go beyond consumption and prices, and focus now also on labour and financial market dynamics through the lens of necessity and discretionary activities. To do so, the first step is to classify industries according to the nature of the goods and services they produce.

We follow the methodology developed by Andreolli, Rickard, and Surico (2024) for the US. The classification of industries proceeds in two steps. First, we distinguish between industries producing final goods and those producing intermediate goods. Industries are classified as “final” if they sell more than one-third of their output directly to households, based on input-output data from Eurostat. Specifically, for each industry, we calculate the share of output sold to final household consumption relative to the total output sold for both their final consumption and as intermediate input. Industries falling below this threshold are classified as “intermediate”.

Final goods industries are then manually assigned to either the necessity or discretionary group based on the nature of their output and our classification of consumption categories. For instance, industries producing food, energy, or essential services are classified as necessity, while those associated with non-essential consumption such as recreation or luxury goods are classified as discretionary. The retail trade sector presents a special case, as it includes both necessity and discretionary consumption items. To reflect this heterogeneity, we split it into two sub-industries: retail trade of necessity goods and retail trade of discretionary goods. To this end, we use the composition of final household consumption categories sold through retail trade, which indicates that 43% of retail trade corresponds to necessity goods. After this adjustment, we obtain 62 distinct 2-digit NACE industries: 10 classified as necessity, 19 as discretionary, and 33 as intermediate, which are further classified in the next step.

Intermediate goods industries are classified based on their indirect contributions to final necessity and discretionary consumption. We use input-output analysis to trace these linkages, computing the Leontief inverse matrix from the Eurostat input-output table, as in Andreolli, Rickard, and Surico (2024). This approach captures both direct and indirect demand by necessity and discretionary final consumption for each intermediate industry. We update the input-output table to reflect the split of retail trade into necessity and discretionary, allocating its inputs and outputs proportionally based on the expenditure shares mentioned above. This implies an assumption that all input suppliers to retail trade serve necessity and discretionary retail activity proportionally—a simplification, but one that ensures consistency with the final demand structure.

Each intermediate industry is then classified based on the share of its output that ultimately supports necessity versus discretionary final consumption. This procedure yields a final classification of the full set of NACE Rev. 2 2-digit industries: 20 are classified as necessity, 37 as discretionary, and 5 remain unclassified. The final classification of NACE Rev. 2 2-digit industries is detailed in Table A5 in the appendix.

An additional complication arises from the change in industry classification systems over time. Prior to 2008, Eurostat reported industry data using the NACE Rev. 1 classification, which differs from the NACE Rev. 2 framework and lacks corresponding input-output tables. To address this, we manually match NACE Rev. 1 2-digit industries with their closest NACE Rev. 2 counterparts and assign each NACE Rev. 1 industry the necessity or discretionary label of its matched Rev. 2 equivalent. In cases where no clear correspondence is available, the industry remains unclassified. Note that the mapping here has less strenuous requirements than an exact mapping of NACE Rev 1 to 2; we only seek to ensure that the necessity vs discretionary classification is consistent over time, not that each matched industry is the same. Out of 61 NACE Rev. 1 2-digit industries, we classify 21 as necessity-producing, 28 as discretionary, and leave 5 unclassified. The final classification of NACE Rev. 2 2-digit industries is detailed in Table A6 in the appendix.

2.3 Labour market

Using our classification of industries, we construct quarterly total employment series for sectors producing necessity and discretionary goods in the Euro Area. Industry-level data on total employment numbers are sourced from the Eurostat Labour Force Survey, for the NACE Rev. 1.1 and for the NACE Rev. 2 classification systems before and after 2008, respectively. To account for structural differences across these classifications, we rescale the pre-2008 data to ensure continuity in the series. We also split employment in the retail trade sector between necessity and discretionary activities, using expenditure shares derived from our input-output analysis. Where quarterly data are missing or only reported at an annual frequency, particularly in the early 2000s, we interpolate the series using employment growth rates from a subset of countries with consistent quarterly data. The resulting sectoral employment series are scaled by total Euro Area population to produce employment rates, which are then seasonally adjusted. More details on the construction of the total employment and the employment rates series in necessity and discretionary industries are included in Section B4 of the Appendix.

To examine the distributional patterns of employment across necessity and discretionary sectors, we use data from the ECB Household Finance and Consumption Survey (HFCS) to compute the share of hand-to-mouth (HTM) households working in each sector across the Euro Area income distribution. Following the approach of Slacalek, Tristani, and Violante (2015) and Kaplan et al. (2014), we define HTM households using data from Wave 2 of the HFCS. A household is classified as hand-to-mouth if its net liquid wealth is non-negative but less than or equal to its biweekly income, or if its net liquid wealth is negative and less than or equal to biweekly income minus an assumed credit limit equal to one month of income.

Industry of employment in the HFCS is reported at the NACE 1-digit level. To align these broader categories with our necessity/discretionary classification at the 2-digit level, we compute the average employment shares within each NACE 1-digit industry that fall into necessity, discretionary, or unclassified groups. Each 1-digit industry is then assigned to the group with the highest share. This is an approximation but would likely only mute the heterogeneity we find, compared to if the detailed industry classification were available. Using this mapping, we compute the share of HTM households employed in necessity and discretionary sectors, both for the full sample and across income quintiles in the Euro Area.

2.4 Financial markets

To analyse equity market dynamics across sectors, we construct stock price and total dividends indices for necessity and discretionary industries using firm-level data from Eikon. Our methodology broadly follows the construction principles of the EURO STOXX 600 Index. For each date in our sample, we obtain the list of EURO STOXX 600 constituents, including ex-dividend prices, the number of free-float market shares, and the NACE Rev. 2, 2-digits industry classification. We also track all changes in index composition—due to periodic rebalancing or corporate events—and record the industry classification of entering and exiting firms. This allows us to identify dates involving rebalancing in either the necessity or discretionary segment of the index.

Using this information, we construct pseudo stock price indices for necessity and discretionary firms. For each category, we calculate market capitalization as the product of ex-dividend prices and free-float shares, summed across all relevant firms in the EURO STOXX 600. To ensure that the indices reflect genuine market dynamics rather than shifts in index composition, we rescale market capitalization using a category-specific divisor that adjusts for non-market-driven changes in index value, such as the inclusion or exclusion of firms due to index rebalancing or firm-specific events.

Unlike the official EURO STOXX 600 methodology, we do not adjust for corporate actions such as dividends, stock splits, or mergers (when they do not imply any changes in the composition of the index), and instead focus solely on changes in the index composition. While this omission could, in principle, distort the level of the index, it should not bias our results provided that these effects are not systematically different between necessity and discretionary sectors. Importantly, using our simplified approach to the divisor—which ignores corporate actions—we obtain an aggregate stock index that correlates 96.7% with the official EURO STOXX 600, providing confidence that our methodology accurately captures broad market dynamics.

To complement the stock price analysis and provide a richer depiction of firm performance in discretionary and necessity sectors, we construct an accompanying measure of dividends. Specifically, we calculate total cash dividends using the EURO STOXX 600 constituents at each given point in time, aggregating dividends across all firms within each category. For each firm, annual cumulative cash dividends are uniformly allocated across quarters. This methodology effectively smooths dividend distributions, mitigating distortions caused by seasonal dividend payments—since firms typically concentrate their distributions in a single quarter—thereby enhancing our ability to isolate business-cycle-related fluctuations. Additionally, all dividend values are expressed in real terms, deflated using the Harmonised Index of Consumer Prices (HICP). Appendix B2 contains more detail on the construction of necessity and discretionary stock price and dividends indices.

2.5 Gross value added and operating surplus

To understand the broader implications of discretionary and necessity dynamics across firms and industries, we turn our attention to the national accounts data. We construct novel series of Gross Value Added, Compensation of Employees, Wages and Salaries and Operating Surplus for the necessity and discretionary sectors, building from disaggregated industry figures. To do this, we combine our industry classification described above with the detailed industry data in the annual accounts, interpolated using more aggregated sectoral quarterly data. The annual data are available until 2022, after which we extrapolate using the quarterly data. Details of this data construction are discussed in the Appendix B.2.

2.6 Frequency of price and wage adjustments

To provide a fuller picture of any possible heterogeneity between discretionary and necessity sectors, we rely on the data underlying the detailed analyses in Gautier et al. (2024) for prices and in Botelho et al. (2025) for wages to compute the frequency of nominal adjustment in the goods and labour market. The frequency of price changes in discretionary and necessity sectors is calculated using granular consumer price data from a sample of 135 million price quotes underlying the Harmonized Index of Consumer Prices (HICP) at the COICOP-5 (five digit) product level for eleven Euro-area countries.

The frequency of wage changes in discretionary and necessity industries is computed using the ECB wage tracker, which in turn relies on granular wage data at the NACE Rev.2 sectoral level for 7 Euro-area countries provided by the Deutsche Bundesbank, the Banque de France, the Banco de España and the Spanish Ministry of Labour and Social Economy, the Banca d'Italia and the Italian National Institute of Statistics (ISTAT), the Oesterreichische Nationalbank and Statistics Austria, the Dutch employers' association AWVN and Statistics Netherlands, Eurostat and Haver Analytics.[5]

3 Descriptive Evidence

In this section, we present descriptive evidence on the behaviour of necessity and discretionary sectors across several key macroeconomic dimensions and throughout business-cycle fluctuations. First, we document how our constructed series for necessity and discretionary sectors evolve over time and across Euro-Area business cycles. Next, we focus specifically on sectoral behaviour during recession periods. We then examine differences in labour force composition between necessity and discretionary industries, emphasizing the sheer heterogeneity in the share of hand-to-mouth households employed in each sector. Additionally, we explore sectoral heterogeneity in the frequency of price and wage adjustments, offering insights into nominal rigidities. Finally, we demonstrate that our necessity-discretionary classification captures economic differences beyond those associated with the traditional distinctions between durables, non-durables, and services.

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[5] Detailed information can be found online on the ECB wage tracker data portal.

3.1 Discretionary and necessity over the cycle

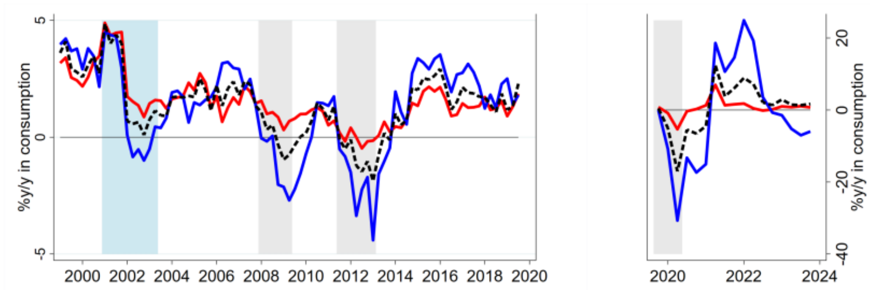
Chart 1 illustrates the cyclical dynamics of necessity and discretionary sectors across consumption, inflation, employment rates, and wages in the Euro Area from 1999 to 2024. Several distinct patterns stand out. First, discretionary consumption exhibits significantly greater cyclicality compared to necessity consumption, characterized by sharper downturns and more pronounced recoveries after a recession. This difference aligns closely with the economic intuition underlying our definition of necessity and discretionary spending: households typically find it easier to postpone or reduce discretionary expenditures during downturns, whereas necessity expenditures remain relatively stable as they relate to essential goods and services. This demand-side effect is clearly reflected in employment patterns: employment rates in discretionary industries display stronger fluctuations throughout business cycles, contracting sharply when discretionary consumption declines and recovering robustly when it rebounds. Conversely, employment in necessity sectors remains notably less volatile, reflecting their relative resilience to cyclical shifts in demand. In terms of price dynamics, however, the pattern reverses. Inflation in necessity sectors demonstrates higher cyclicality and sensitivity to macroeconomic fluctuations, rising and falling more markedly around cyclical turning points compared to inflation in discretionary sectors.

In Section 5, we formally test whether the higher cyclicality observed in discretionary consumption, discretionary employment, and necessity prices translates into stronger predictive power for key macroeconomic aggregates. Using the Granger Causal Priority approach of Jarociński and Maćkowiak (2017), we confirm that these variables indeed possess notably stronger leading indicator properties for aggregate output and inflation compared to their respective counterparts. Finally, it is noteworthy that negotiated wage indices show no clear differences in cyclical patterns between necessity and discretionary industries, suggesting similar wage-setting behaviour and nominal rigidity —a conjecture we explicitly verify in Section 3.4, where we find no differences in wage stickiness between the two sectors.

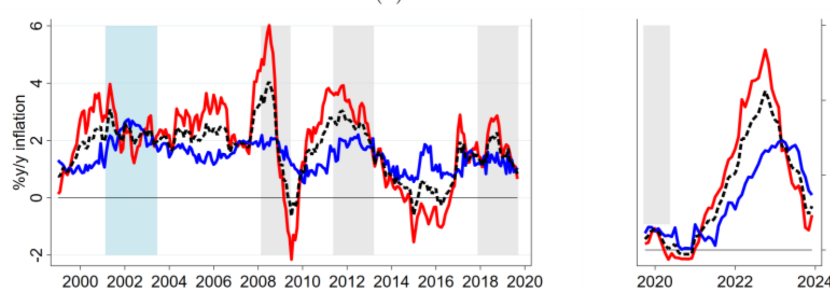
Chart 1

Consumption, Inflation, Employment and Negotiated Wages

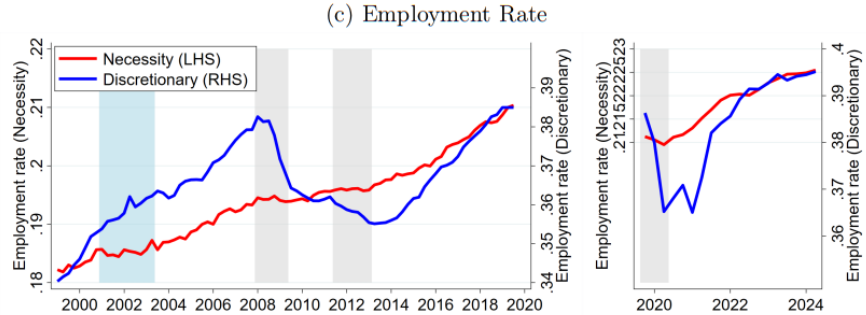
(a) Consumption



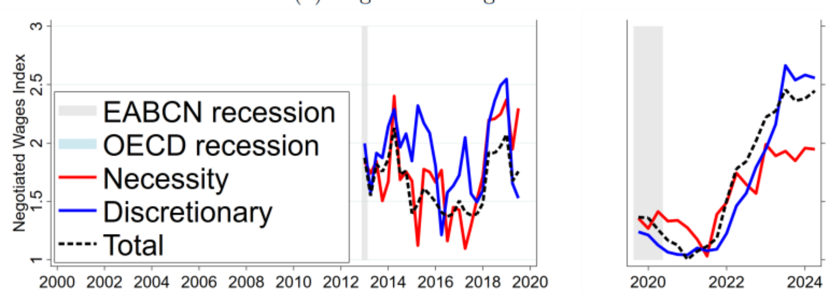
(b) Inflation



(c) Employment Rate

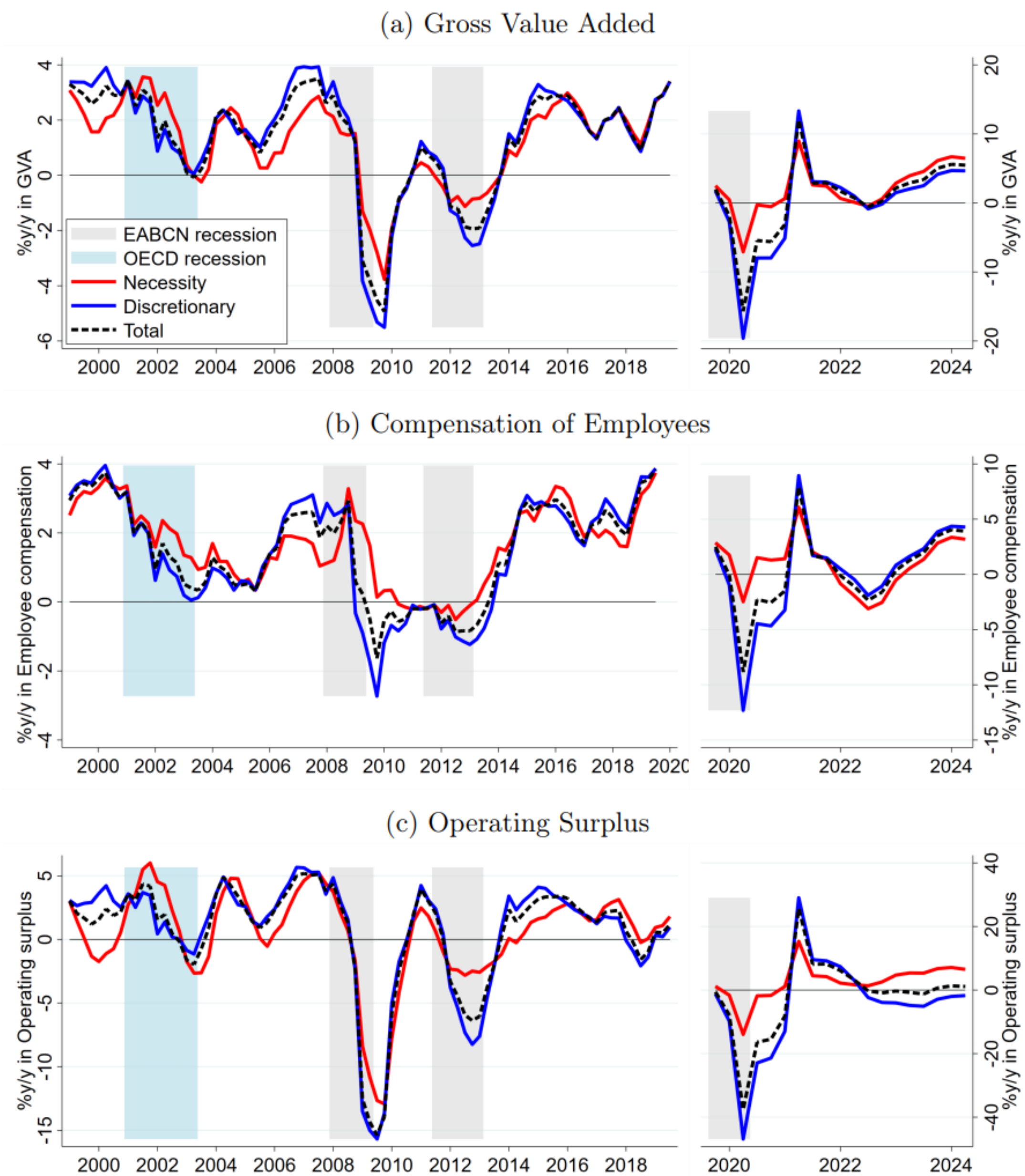


(d) Negotiated Wages Index



Sources: Authors calculations based on Eurostat quarterly, annual National Accounts, ECB wage tracker.
Notes: The table presents data on consumption, inflation, employment rate, and wages, both in aggregate and disaggregated into necessity and discretionary goods and industries. Consumption and wages are reported as annual growth rates, while inflation and the employment rate are shown as annual changes. See the Appendix for details on data construction.

Chart 2
Operating surplus



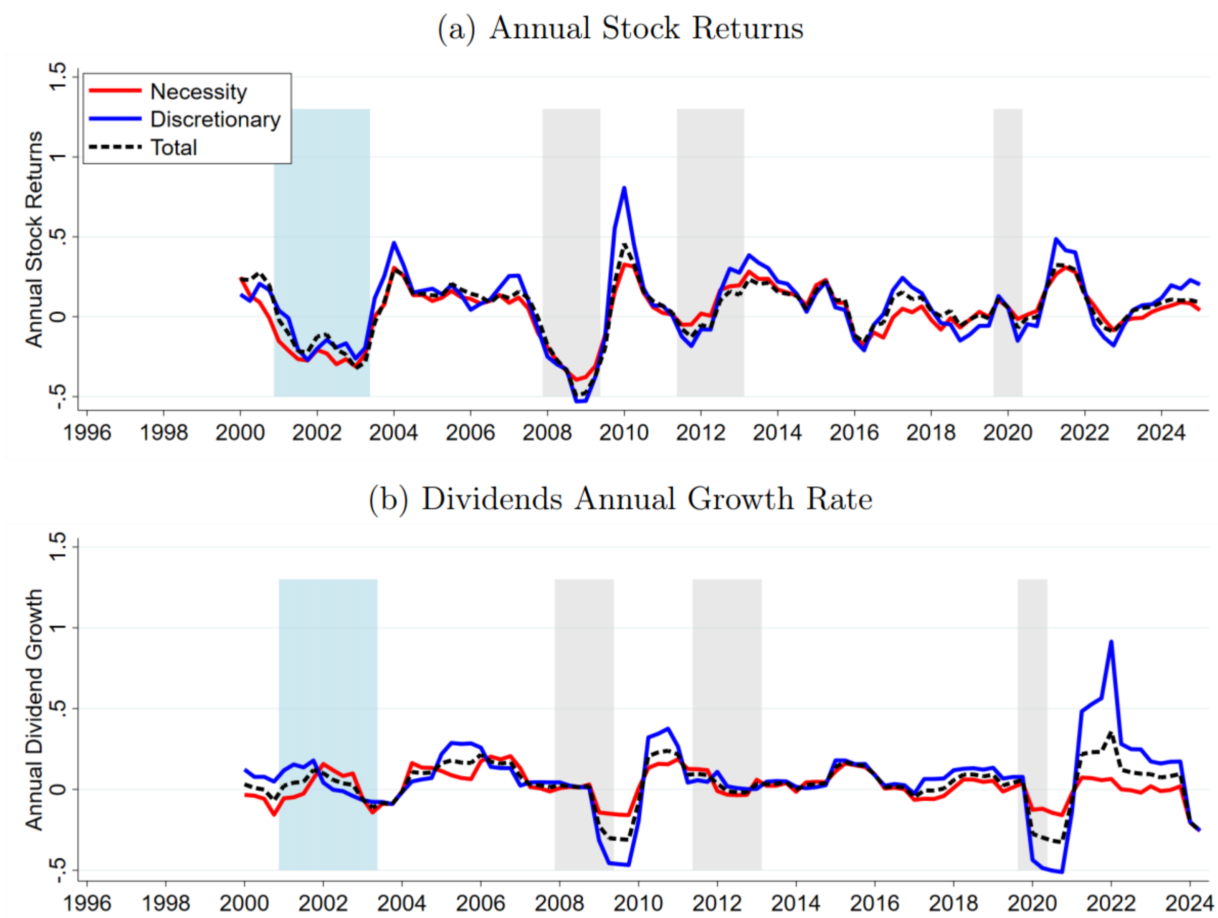
Sources: Authors calculations based on Eurostat quarterly and annual National Accounts.
Notes: GVA, Operating Surplus and Employee compensation, both in aggregate and disaggregated into necessity and discretionary industries. All series are real and indexed to 100 in 2015.See Appendix for data construction details.

Chart 2 shows the dynamics of key sectoral national account indicators; Gross Value Added, Operating Surplus and Compensation of Employees. A key finding is that the sectoral heterogeneity seen in Chart 1 extends to this data and suggests that dynamics of discretionary spending are also driving broader macroeconomic aggregates. During the pandemic, the discretionary components of GVA, operating surplus and compensation of employees fell more sharply than necessity, accounting for the bulk of the decline in aggregates. Moreover, this pattern is also visible during the debt crisis and financial crisis.

In addition, we note a diverging trend in operating surplus in the aftermath of the 2022 inflationary period. During this time, operating surplus is flat in real terms. Underlying this, however, there is actually a substantial increase in profits in necessity sectors, while profits in discretionary sectors have declined. This may suggest significant differences in mark-up trends across sectors during periods of substantial inflation.

The top panel of Chart 3 presents annual stock returns (excluding dividends) for necessity and discretionary sectors alongside the aggregate annual stock market returns computed on our necessity, discretionary and aggregate stock price indices from 1999 to 2024. The bottom panel of Chart 3 presents annual dividend growth in necessity and discretionary industries, and aggregate annual dividend growth. Consistent with the patterns previously documented for consumption and employment, returns in discretionary sectors exhibit notably more pro-cyclical behaviour compared to necessity sectors. This evidence likely reflects investors' perceptions of discretionary industries as more sensitive—and necessity industries as comparatively less sensitive—to macroeconomic fluctuations. Consistently, also the dividends of firms in discretionary sectors are more pro-cyclical that the dividends of firms in necessity sectors, suggesting discretionary firms pass on the cyclicality of their revenues and profits to investors.

Chart 3
Annual Stock Returns & Dividends in Necessity and Discretionary Industries



Sources: Authors' calculations based on data from Refinitiv Eikon.

Notes: The table reports the annual stock returns and the aggregate dividends for the aggregate market, as well as for necessity and discretionary sectors. The indices are constructed following a methodology similar to the one of the EUROSTOXX600. See the Data Appendix for details on the construction of the indices.

3.2 Zooming in on Recessions

This section examines the behaviour of consumption, employment and inflation during the three last recessions in the Euro Area. The aim is to understand the relative contributions of necessity and discretionary sectors to aggregate dynamics during recessions. In Chart 4, we present the decomposition of changes in consumption growth (top row), employment rates (middle row) and inflation (bottom row) during the Great Financial Crisis (let column), the Sovereign Debt Crisis (center), and the COVID-19 Pandemic (right column), relatively to the start of each of these recessions.

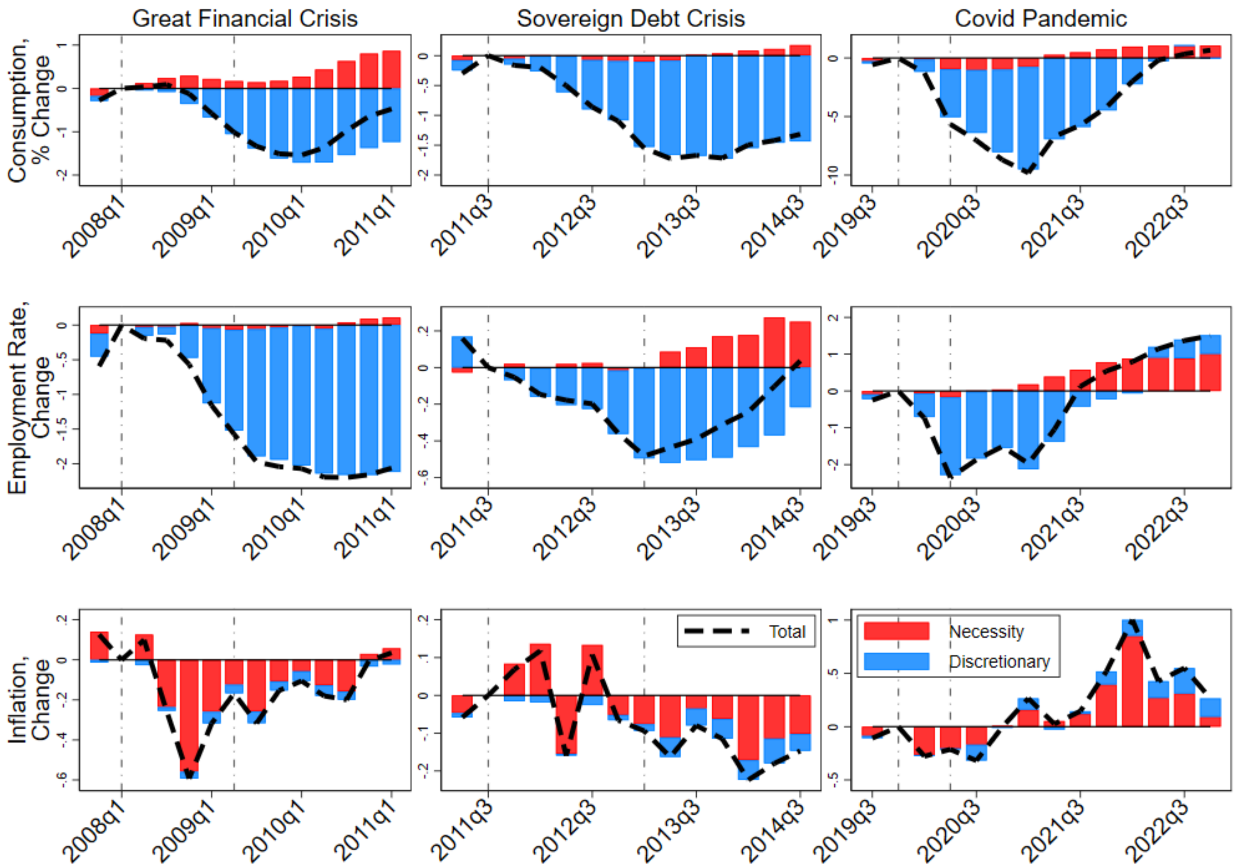
In all three episodes, the slowdown in aggregate consumption is largely accounted for by declines in discretionary consumption, while necessity consumption remains stable. A similar pattern emerges for employment: most of the contraction is concentrated in discretionary industries, with very little movement recorded for necessity sector employment. As for prices, we find instead that necessity goods and services drive the dynamics of inflation in each of three past Euro-area recessions.

Our calculations suggest that, on average across all these three events, spending and employment in the discretionary sector account for 95% and 67% of the dynamics of aggregate consumption and aggregate employment, respectively. In contrast, discretionary spending inflation is responsible for only an average 14% across these three recessions.[6] These results suggest that the discretionary sectors play a key role in driving the cyclical variation of quantities while necessity sectors dominate the movements in prices.

Chart 4
Unconditional Responses During Recessions

Consumption growth, changes in employment rates and inflation rates in necessity and discretionary goods/ industries during recessions

[6] Detailed calculations underlying these analyses are further elaborated in Appendix D.



Sources: Authors' calculations based on our constructed series of necessity/discretionary consumption and employment rate.
Notes: The table reports the unconditional responses of consumption and the employment rate—both in aggregate and disaggregated into necessity and discretionary components—during the Global Financial Crisis, the Sovereign Debt Crisis, and the COVID-19 pandemic. Responses are calculated as differences (in logs for consumption) relative to the start of each recession and, for consumption, weighted by their respective consumption amounts. Recession dates are based on EACBN classifications.

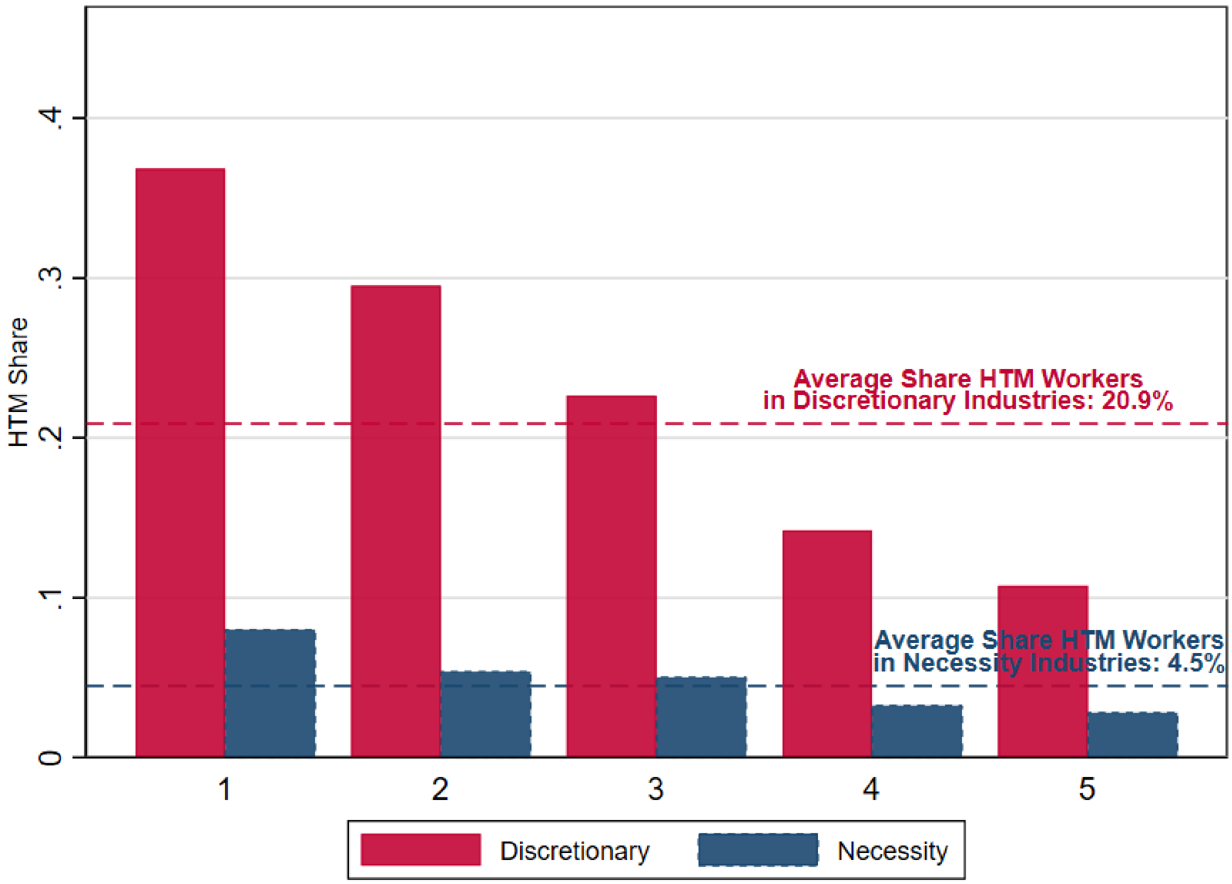
3.3 Labour force composition

Figure 5 presents the share of hand-to-mouth (HTM) households employed in necessity and discretionary sectors across income quintiles in the Euro Area, constructed using data from the ECB-HFCS. Two main findings emerge. First, discretionary industries exhibit a share of HTM workers that is almost five times larger than that observed in necessity industries—20.9% versus 4.5%, on average across all income quintiles.[7] Second, this sectoral gap is particularly pronounced at the bottom of the income distribution, with around 37% of workers in discretionary industries classified as HTM in the lowest quintile, compared to only about 8% in necessity industries. The difference steadily narrows among higher earners, falling to roughly 11% in discretionary and 3% in necessity industries in the top income quintile. These patterns highlight that lower-income HTM households—whose consumption is inherently more sensitive to income fluctuations—are disproportionately concentrated in discretionary sectors. Consequently, the higher employment cyclicality observed in discretionary industries, combined with the elevated concentration of workers with high marginal propensities to consume in these sectors, points to potential second-round effects and a possible amplification mechanism for macroeconomic shocks, consistent with the results for the U.S. by Patterson (2023).

[7] This is consistent with Slacaleck et al. (2020), who show that around 25% of households may be financially constrained in the Euro-area.

Chart 5
Hand-to-Mouth Workers in Necessity and Discretionary Industries

Shares by Euro Area Income Quintiles



Sources: Authors' calculations based on data from the ECB-HFCS, and following the methodology of Slacalek, Tristanti, and Violante (2020).
Notes: This figure shows the share of hand-to-mouth workers across income quintiles employed in necessity and discretionary sectors in the Euro Area. Sectors are classified as necessity or discretionary according to our standard definition. Income quintiles refer to the Euro Area distribution.

3.4 Frequency of price and wage adjustments

Our descriptive evidence in Chart 1 shows a higher volatility in necessity prices than discretionary prices. This higher volatility extends, as shown in the next section, to the response to monetary policy shocks. In this section we further demonstrate that prices in necessity sectors are adjusted more frequently. Table 2 shows further the average frequency of price adjustments in the Euro area overall, and for necessity and discretionary consumption categories. We construct these following closely the approach of Gautier et al (2024); we classify consumption categories at the COICOP-5 digit level, using the classification discussed in Section 2.1. The results in Table 2 are based on country-specific time periods and on products that are common to at least three of the four largest countries, as in Table 2 of Gautier et al (2024). Prices in necessity sectors have a 14.9% probability of being adjusted each month; substantially higher than the 10.1% in discretionary sectors. This heterogeneity is also true when excluding sales, using the sales filter of Gautier et al. This pattern can also be seen in median price adjustment frequencies and using an alternative approach to identifying sales periods (results available upon request). On the other hand, the third column reveals that there is limited sectoral heterogeneity in the frequency of wage adjustment; this is around 4.2%, which is singificantly small and thus more rigid than for prices.

Table 1
Nominal rigidity across discretionary and necessity sectors

Average frequency of price changes per month (%)

sector	Prices		Wages	
	All	Excluding sales	All	Excluding one-off
Euro area	12.3	7.9	4.2	3.8
Necessity	14.9	10.3	4.2	4.1
Discretionary	10.1	6.0	4.3	3.9

Sources: Authors' calculations based on the granular data underlying the analyses in Gautier et al. (2024) for price changes and Botelho et al. (2025) for wage changes.
Notes: The statistics in this table are based on the approach and euro-area adjustment by Gautier et al (2024) for price changes (by Botelho et al (2025) for wage changes) applied to discretionary and necessity consumer spending categories at the COICOP-5 level (industries at the NACE Rev. 2 level). These are classified using the approach described in Section 2.1 and sector averages taken using the same consumption weights as in Gautier et al (2024) (employment weights as in Altavilla et al (2025)). Price (wage) adjustment frequency is average probability per month. The column 'excluding sales' ('excluding one-off') excludes sales using the sales filter of Gautier et al (2024) (one-off compensation payments).

3.5 Beyond the durables, non-durables and services categorization

Table 2 highlights the key distinction between necessity and discretionary expenditure, demonstrating how this division differs substantially from the conventional categorization of consumption into durables & semi-durables, non-durables, and services. While nearly all durable and semi-durable spending is discretionary, significant portions of spending on services (around 17.5%) and non-durables (about 9%) are also discretionary. Taken together, discretionary expenditures account for almost half (44%) of the Euro-area consumption basket. In Chart A3 in Appendix D, we further show that discretionary consumption exhibits greater volatility compared to necessity consumption within each durability category. Notably, consumption of discretionary services displays volatility comparable to durable goods—an expenditure category which, according to our classification, is entirely discretionary. Moreover, discretionary expenditures in both services and non-durable goods are substantially more volatile than their necessity counterparts. Additionally, figure A4 in appendix D shows that non-durable necessity goods exhibit the highest volatility. The prices of discretionary non-durables and services show intermediate levels of volatility, while discretionary durables and necessity services demonstrate the lowest price volatility.

Table 2
The composition of non-durables, services and durables & semi-durables

Whole economy, necessity and discretionary expenditure share

Shares (%)

sectors	Non-durables	Services	Durables & Semi-durables	Share of total
Euro area	35%	47.5%	17.5%	100%
Necessity	26%	30%	0	56%
Discretionary	9%	17.5%	17.5%	44%

Sources:
Notes: The table reports average expenditure shares in the Euro Area from 1995 to 2023, disaggregated into durables, non-durables, and services, and further into necessity

and discretionary categories within each group. The data are sourced from Eurostat. The classifications of necessity vs. discretionary goods and of durables, non-durables, and services follow definitions provided by the UK Office for National Statistics (ONS). Durables include also semi-durables such as clothes and watches.

4 Main results

In this section, we present our main empirical results. We begin with the identification of monetary policy shocks and the empirical framework before moving to the main impulse response function analysis. The Appendices contain a wide range of robustness checks, in terms of sample, identification, empirical models and additional variables.

4.1 Shock identification

Testing the impact of monetary policy on macroeconomic variables typically faces identification challenges. To address these, we estimate the responses to an identified monetary policy shock within a Bayesian VAR framework, closely following Jarocinski and Karadi (2020). Specifically, we rely on their "poor man" identification of monetary policy shocks. Those are defined as high-frequency surprises in 3-months EONIA interest rate swaps (OIS), occurring around ECB monetary policy announcements, during months when stock price surprises move in the opposite direction. The first identification assumption is that high-frequency surprises in OIS rates and the EURO STOXX 50 are influenced *exclusively* by monetary policy and central bank information shocks, due to the narrow time window considered. The second identification assumption is that monetary policy shocks induce *negative co-movements* between interest rates and stock prices—as standard theory predicts—as opposed to central bank information shocks, that result in *positive co-movements*. The shocks are constructed at the monthly frequency by aggregating intraday surprises observed during ECB monetary policy announcements within each month. When the co-movement between high-frequency surprises in OIS rates and stock prices is positive (negative), monetary policy (central bank information) shocks are set to zero.

For robustness, we also estimate an alternative version of the BVAR using the sign-restriction identification approach proposed by Jarocinski and Karadi. The sign restrictions follow the same logic of the “poor man” identification. Monetary policy shocks are assumed to be associated with a negative co-movement, while central bank information shocks exhibit a positive co-movement, in high-frequency surprises in OIS rates and stock prices around ECB monetary policy announcements. The two shocks are assumed to be orthogonal to each other. Differently from the “poor man” case, this specification allows both shocks to occur simultaneously within the same month. In practice, the shocks are identified by initially imposing a block-Cholesky structure, with the two announcement shocks forming the first block, followed by the application of sign restrictions on contemporaneous responses. Given that this method provides only set identification—meaning each VAR parameter draw yields multiple plausible shocks and impulse responses consistent with the restrictions—posterior draws of shocks, associated impulse responses, and confidence intervals are computed using a uniform prior on rotations, following Rubio-Ramírez, Waggoner, and Zha (2010).

We compute “poor man” and sign restriction quarterly shocks, to match the frequency of the rest of our macroeconomic variables, by cumulating monthly shocks from directly taken from Jarocinski and Karadi within each quarter. In appendix F, we show the time series of “poor man” and sign restriction shocks employed in our analysis.

4.2 Empirical framework

To estimate the impact of monetary policy on our variables of interest—across necessity and discretionary economic activities, we employ an array of BVARs at quarterly frequency. To avoid the curse of dimensionality, we add one necessity/discretionary variable at a time to the baseline specification of Jarocinski and Karadi. This is estimating a BVAR with the priors of Litterman (1979), in which the monetary policy shocks and central bank information shocks enter as internal instruments. Although our primary focus is on the effect of monetary policy shocks, we follow Jarocinski and Karadi and account contemporaneously for both monetary policy and central bank information shocks in our specification. Specifically, for each of our necessity/discretionary variable we estimate:

$$\begin{pmatrix} \mathrm{m}_t \\ \mathrm{y}_t \end{pmatrix} = \sum_{\mathrm{p}=1}^{\mathrm{P}} \begin{pmatrix} 0 & 0 \\ B_{YM}^P & B_{YY}^P \end{pmatrix} \begin{pmatrix} \mathrm{m}_{t\text{-p}} \\ \mathrm{y}_{t\text{-p}} \end{pmatrix} + \begin{pmatrix} 0 \\ C_Y \end{pmatrix} + \begin{pmatrix} \mathrm{u}_t^m \\ u_t^y \end{pmatrix}, \begin{pmatrix} \mathrm{u}_t^m \\ u_t^y \end{pmatrix} \sim N(0, \Sigma)$$

Here $y_t$represents one of the necessity or discretionary variables under analysis, included separately in each specification, alongside a consistent set of control variables. These controls match those chosen by Jarocinski and Karadi (namely, GDP, HICP, 1-year yield, stock index, and excess bond premium), with the addition of the unemployment rate. m_t represents a vector of 'poor man' monetary policy and central bank information shocks. The restriction imposed is that m_t doesn't depend on the lags of either y_t or m_t and has zero mean. Our BVARs are implemented at the quarterly frequency and include four lags of y_t. For the bulk of our analyses, we use data from 1999q1-2024q2. For disaggregated price indices and the ECB wage tracker series, we start from 2003q1 and 2013q1, respectively. In the Appendix, we show the estimated IRFs of the baseline set of variables, which are consistent with those of Jarocinski and Karadi (2020). We also show that the results are robust to excluding the covid pandemic period and its subsequent inflation, and using the alternative, sign-restriction based approach.

4.2 The unequal effects of monetary policy

In Chart 5a, we illustrate the heterogeneous responses of discretionary and necessity macroeconomic variables to monetary policy shocks. Specifically, the figure reports impulse response functions (IRFs) for aggregate, necessity, and discretionary variables across key sectors. The final column presents the IRFs of the ratio between discretionary and necessity responses in each sector, thus highlighting whether differences in responses are statistically significant.

Consistent with our descriptive findings, discretionary consumption drives the bulk of the response in aggregate consumption following monetary policy shocks. Discretionary consumption declines notably, reaching a maximum contraction of approximately 80 basis points four quarters after a one-standard-deviation monetary policy shock. In contrast, necessity consumption shows little or no response. This divergence is both economically meaningful and statistically significant, as confirmed by the IRFs for the discretionary-to-necessity consumption ratio. Conversely, price responses in necessity sectors are notably larger, declining by about twice as much as prices in discretionary sectors.

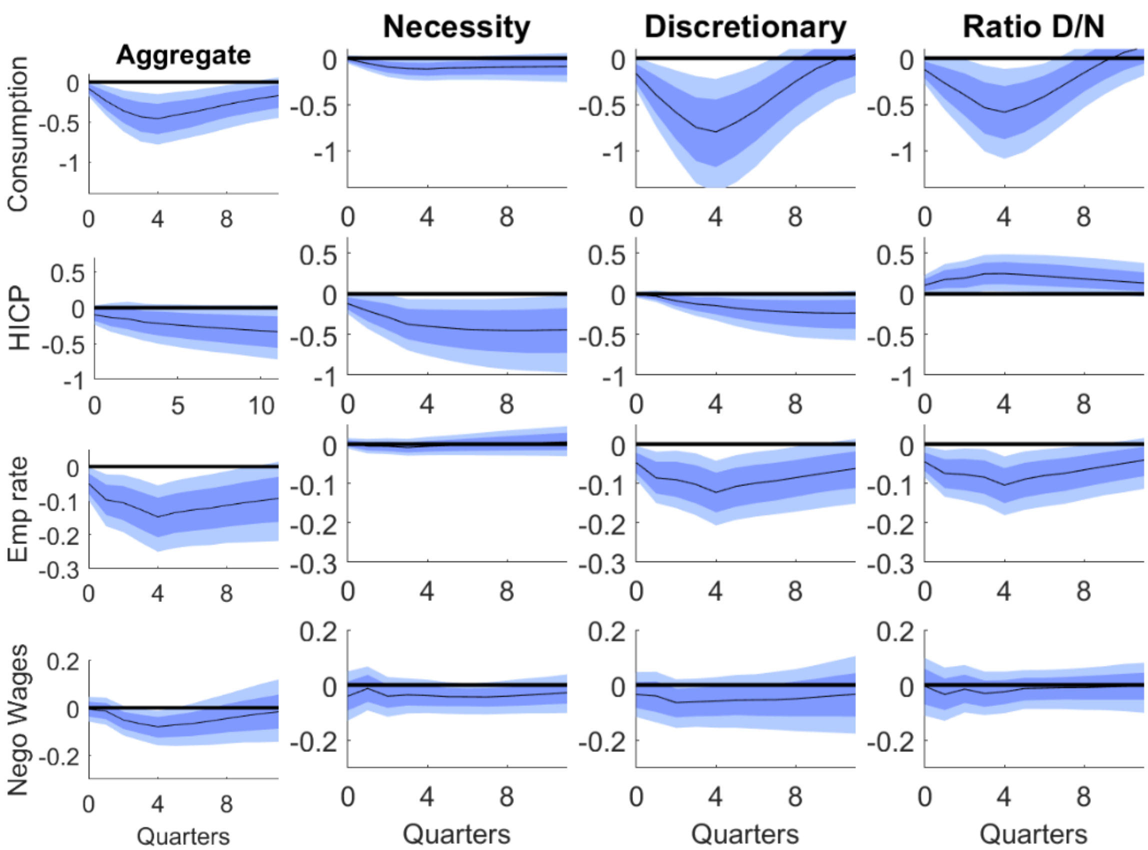
This heterogeneity in consumption and prices translates into differential effects on the sectors producing these goods and services. Employment in discretionary industries contracts by just over 0.1 percentage points, whereas employment remains stable in necessity industries. Wage adjustments, however, appear similar across both sectors. The fourth row of the chart presents IRFs based on the ECB wage tracker, indicating little heterogeneity in per-employee salaries between necessity and discretionary sectors. Consequently, differences in overall employee compensation appear driven primarily by changes in employment rather than wages. Nevertheless, it is important to acknowledge that the ECB wage tracker data only start in 2013, which limits the variation and potentially reduces our ability to fully capture the sectoral heterogeneities.

Chart 5b shows that the cyclicality observed in discretionary goods also manifests prominently in stock market dynamics. Following a monetary policy shock, the immediate response of discretionary stock prices is twice as large as that of necessity stocks. This initial difference is statistically significant, though after one quarter, the responses of the two sectors converge. Furthermore, the higher cyclicality of discretionary industries extends to firms' dividend distribution policies: dividends paid by firms in discretionary industries decline roughly twice as much as those in necessity industries after a monetary policy tightening.

Chart 5a

IRFs to a monetary policy shock

Estimated IRFs of main macro variables to a monetary policy shock

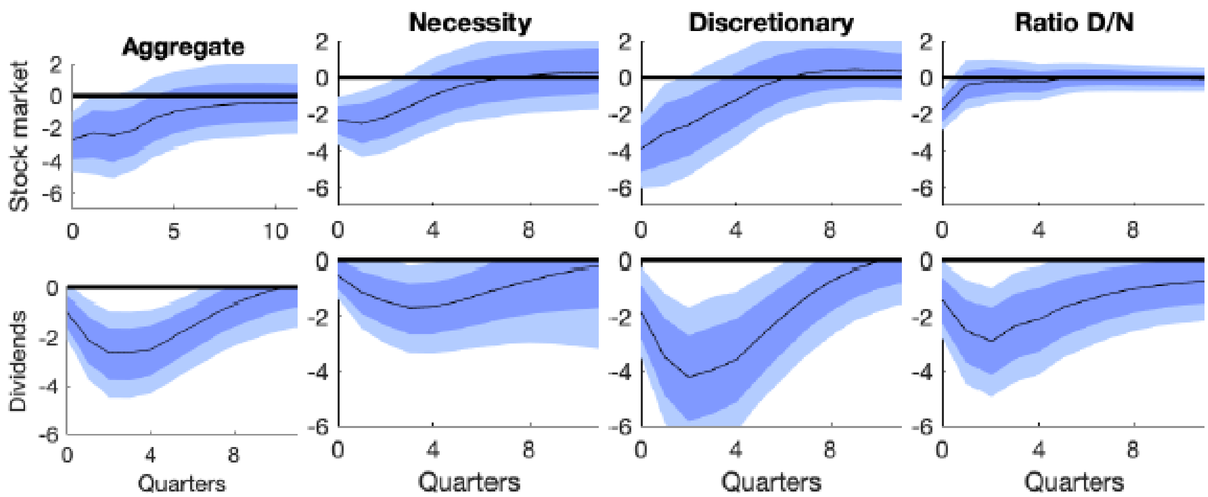


Notes: IRFs in response to a one standard deviation monetary policy shock of consumption, HICP, employment rate and negotiated wages (based on the ECB's negotiated wage tracker). IRFs are from a BVAR on a quarterly sample 1999-2024q2, other than wage tracker, which is estimated on the available sample 2013q1-2024q2. Median (line), percentiles 16–84 (darker band), percentiles 5–95 (lighter band). Quarters on the horizontal axes. Each IRF corresponds to a separate BVAR estimate with the respective variable added as an additional variable to the baseline controls (monetary policy shocks, 1y yield, GDP, HICP, stock index, unemployment, corporate bond spread). See text for full specification details and Appendix for IRFs of baseline controls.

Chart 5b

IRFs to a monetary policy shock

Estimated IRFs of main financial variables to a monetary policy shock



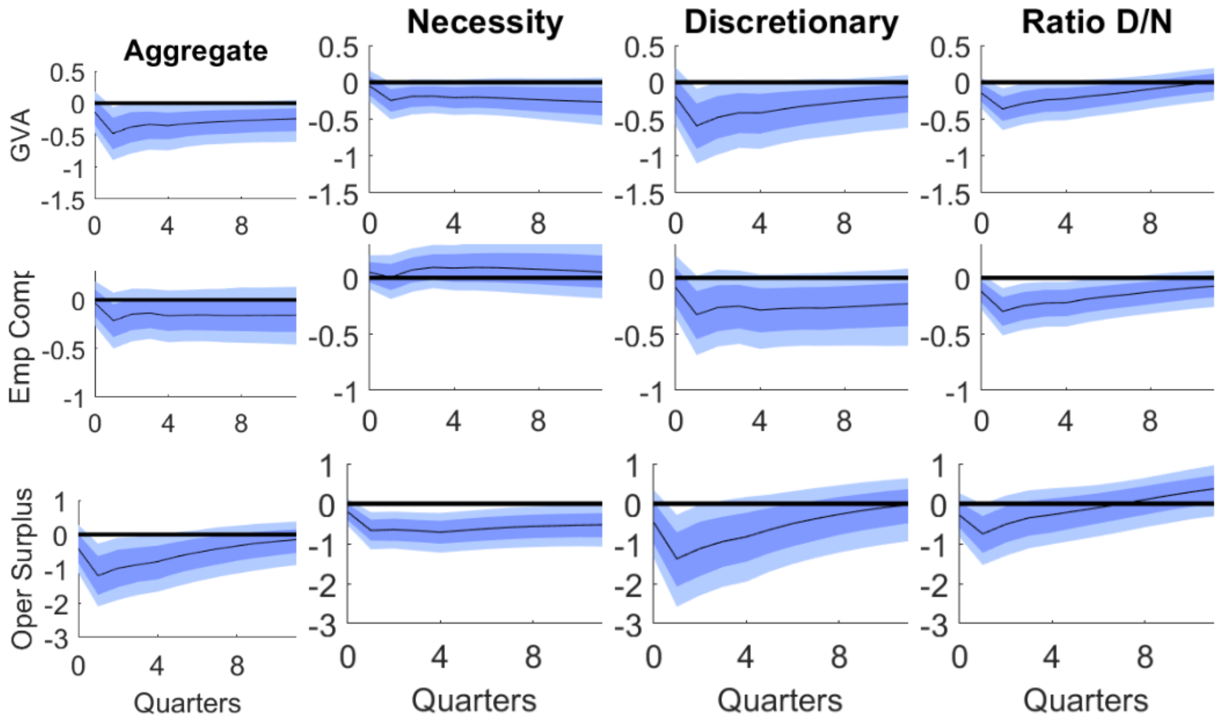
Notes: IRFs in response to a one standard deviation monetary policy shock, estimated using a BVAR on a quarterly sample 1999-2024q2. Median (line), percentiles 16–84 (darker band), percentiles 5–95 (lighter band). Quarters on the horizontal axes. Each IRF corresponds to a separate BVAR estimate with the respective variable added as an additional variable to the baseline controls (monetary policy shocks, 1y yield, GDP, HICP, stock index, unemployment, corporate bond spread). See text for full specification details and Appendix for IRFs of baseline controls.

Finally, Chart 6 shows that the sectoral heterogeneity is also visible in national accounts data. Here, we leverage the sectoral gross value added, compensation of employees and operating surplus series we describe in Section 2.4. Gross value added declines twice as much in discretionary industries than necessity industries in response to a monetary policy contraction. This difference is statistically significant, as shown in the final column. Furthermore, we can decompose this into two major components of GVA: compensation of employees and operating surplus. Both components decline but the fall in discretionary sectors is more pronounced, although the decline in compensation of employees is both smaller in magnitude and not significant at the 90% level.

The response of operating surplus shows the impacts of the different discretionary and necessity price and consumption dynamics. As shown in Chart 6, in necessity sectors, consumption is stable, and prices decline substantially. In addition, employment is stable, while our tentative evidence suggests that wages were relatively stable. The net effect is the operating surplus declines somewhat, due to the price declines. In contrast, operating surplus in the discretionary sectors declines by more, as the drop in employment is not sufficient to offset the larger fall in demand; this is despite the finding that prices do not decline as much as in necessity sectors.

Chart 6
IRFs to a monetary policy shock

Estimated IRFs of national accounts variables to a monetary policy shock



Notes: IRFs in response to a one standard deviation monetary policy shock, estimated using a BVAR on a quarterly sample 1999-2024q2. Median (line), percentiles 16–84 (darker band), percentiles 5–95 (lighter band). Quarters on the horizontal axes. Each IRF corresponds to a separate BVAR estimate with the respective variable added as an additional variable to the baseline controls (monetary policy shocks, 1y yield, GDP, HICP, stock index, unemployment, corporate bond spread). See text for full specification details.

5 Leading indicator analysis

Predicting the business cycle

Table 3
Leading indicator properties of necessity and discretionary variables

Euro-area GDP and HICP

P-value on Granger Causal Priority

Predicting:		GDP and HICP		GDP		HICP	
		Agg	Nec/Disc	Agg	Nec/Disc	Agg	Nec/Disc
Cons	*Agg*	0.0001		0.0000		0.0000	
	Nec		0.0027		0.0019		0.0012
	Disc		0.0000		0.0000		0.0000
Emp rate	*Agg*	0.0072		0.0126		0.0094	
	Nec		1.0000		0.9991		0.9990
	Disc		0.0341		0.0265		0.0182
Prices	*Agg*			0.0001			
	Nec		0.0000		0.0073		0.0072
	Disc		0.9993		0.9999		0.9982
GDP	*Agg*					0.0002	
GVA	*Nec*		0.0000		0.0002		0.0006
GVA	*Disc*		0.0000		0.0000		0.0001
Stock mkt	*Agg*	0.0529		0.0585		0.0591	
	Nec		0.0032		0.0032		0.0018
	Disc		0.0003		0.0009		0.0000
Dividends	*Agg*	0.1168		0.1044		0.1120	
	Nec		0.9868		0.9956		0.9903
	Disc		0.0427		0.0312		0.0249
Unemp Rate		0.0002	0.0001	0.0000	0.0002	0.0000	0.0000
Ind conf		0.0018	0.0000	0.0002	0.0000	0.0004	0.0001
Oil price		0.0717	0.0087	0.0746	0.0079	0.0815	0.0131
US GDP		0.0151	0.0063	0.0143	0.0042	0.0170	0.0059
EURUSD		1.0000	0.9998	0.9998	0.9997	0.9997	1.0000

Sources: Author's calculations
Notes: GCP of Jarocinski and Makowiak; probability that the variable are not causally prior to GDP, HICP or both. Each column is a separate model, quarterly data 1999-2019. Only selected aggregate variables included in table from estimation.

In this section, we demonstrate one further practical application of the split between necessity and discretionary variables; their predictive power over the business cycles. To do this, we follow the approach to leading indicator analyses proposed by Jarociński and Maćkowiak (2017). They suggest testing whether particular variables (say, discretionary consumption) are relevant for the dynamics of important macro aggregates by testing for Granger Causal Priority (GCP). This tests whether the given potential leading indicator variable is within a set of variables that are not causally prior to a set of outcome variables (here, GDP and HICP). We follow their methodology closely, using a set of aggregate variables within a Bayesian VAR, and a similar specification of 4 lags and the same priors that Jarociński and Maćkowiak (2017) use. We estimate this on a quarterly sample 1999-2019; where we don't have sufficiently long discretionary and necessity series, we extend these series back using the aggregated series, in order to estimate using the same BVAR.

In Columns 2, 4 and 6 of Table 3, we report the results of the test of Granger Causal Priority for a selection of variables. This displays the probability of a test that the variable is not causally prior to the explanatory variables, at the head of the column; a result close to 1 suggest evidence that the variable is not causally prior to the outcome variables, i.e. has less of a leading indicator property. In Columns 3, 5 and 7, we show the results when we swap out some aggregate variables for both their discretionary and necessity counterparts; we use this to assess whether any sectoral variable is driving the leading property of their aggregate counterparts. Consumption and the stock indices in both discretionary and necessity sectors are highly predictive for GDP and HICP. However, we find substantial heterogeneity in the predictive power of price indices, employment and dividends. Discretionary employment and dividends are highly predictive, while necessity employment and dividends are not. On the other hand, necessity spending inflation is much more relevant for the business-cycle than discretionary spending inflation.

6 A new framework for optimal monetary policy

In this section, we demonstrate why the distinction between necessity and discretionary goods is not just an important feature of business cycle fluctuations but also has significant policy implications. To investigate this, we build a model that includes some of the key heterogeneities between sectors highlighted by our empirical analysis on Euro area data of the previous sections. This model provides a laboratory to explore the implications of different monetary policy stances; in particular, the benefits of targeting discretionary spending inflation.

6.1 Theoretical set up

The theoretical set up follows the model presented in Andreolli, Rickard and Surico (2024). We introduce in an otherwise standard heterogenous agents New Keynesian model two new features: (i) non-homotheticity; (ii) sectoral heterogeneity, in the form of hand-to-mouth workers being more likely to be employed in the discretionary sectors.

Households. The economy is populated by two types of households: High productivity/Ricardian households (H) who have access to financial markets and Low productivity/Hand-to-Mouth households (L) who do not. These households (i=H,L) all face the same non-homothetic utility function, which in each period takes the following form:

$$U\left(C_{i,t}^{N}, C_{i,t}^{D}, N_{i,t}\right) = \frac{\left(C_{i,t}^{N}\right)^{1-\frac{1}{\gamma^{N}}}}{1-\frac{1}{\gamma^{N}}} + \varphi \frac{\left(C_{i,t}^{D}\right)^{1-\frac{1}{\gamma^{D}}}}{1-\frac{1}{\gamma^{D}}} - \xi \frac{N_{i,t}^{1+\chi}}{1+\chi}$$

Households consume Necessity goods and services ($C_{i,t}^{N}$), Discretionary goods and services ($C_{i,t}^{D}$), and face a disutility from supplying labour ($N_{i,t}$). The parameters that govern the utility function are the Intertemporal Elasticity of Substitution (IES) for necessitiesγ^{N}, the IES for discretionaries γ^{D}, the Frish elasticity χ, the scaling parameter for the relative weight of discretionaries φ, and the scaling parameter for the disutility of labour ξ.

The good with the higher IES will also have a higher Income Elasticity of Demand (IED). $\gamma^{D} > \gamma^{N}$ implies that D is both consumed relatively more by higher income households, that it is, a discretionary or luxury good, and that it is easier to shift intertemporally. The intuition is that it is easier to postpone a vacation than grocery. A main advantage of our specific utility function formulation is that it allows us to make it transparent the mapping between the IES and the IED, though this is a general property of non-homothetic utility functions. Indeed, Browning and Crossley (2001) prove that discretionary are easier to shift intertemporally for utility function that is separately additive in goods. Andreolli and Surico (2025) show that this property accounts for the MPC heterogeneity across spending categories and sizes of the income shock documented by a vast empirical literature.

In the analysis of monetary policy, the mapping between IES and IED is important because it implies that all households cut discretionary spending more following a decline in income due to an increase in interest rates.

Households with workers losing their job cut discretionary spending as they move along the Engle curve. But also Ricardian households lower temporarily their discretionary spending; the reason is that the higher interest rate provides them with an incentive to postpone the purchase of goods and services that are not strictly necessary. This channel is separate from standard heterogenous agents models where only the consumption of Hand-to-Mouth agents matters for amplification. This is because in our novel framework the consumption of the Ricardian agents also matters for the sectoral composition of consumption cyclicality.

The household block is finalized with households who are inattentive over consumption and saving choices as in Mankiw and Reis (2007), that is, they update expectations with probability λ. This allows the model to generate a hump shape response of consumption to a monetary policy shock consistent with the empirical evidence presented in Chart 5. Finally, we let the Ricardian agents receive firms' profits, similarly to Bilbiie (2008) and Debortoli and Galí (2024).

Firms. The economy consists of two sectors that produce discretionary and necessity goods. The production of wholesale goods of the two sectors differs in the share of low vs high skilled workers that they employ. Specifically, the two production functions take the following Cobb-Douglas functional forms:

$$Y_t^N = A_t^N \left(N_{L,t}^N\right)^{\alpha^N} \left(N_{H,t}^N\right)^{1-\alpha^N} \quad \text{and} \quad Y_t^D = A_t^D \left(N_{L,t}^D\right)^{\alpha^D} \left(N_{H,t}^D\right)^{1-\alpha^D}$$

where, for each sector i, Y_t^i is the quantity of goods produced, A_t^i is the technology of this sector, $N_{L,t}^i$ is the labour of low skilled workers employed in this sector, $N_{H,t}^i$ is the corresponding for high skilled workers, and α^i is the share of low skilled labour employed in that sector. Consistent with the empirical evidence for the Euro area presented in Chart 5 of Section 3.3, we set $\alpha^D > \alpha^N$: discretionary industries tend to employ a higher share of Hand-to-Mouth low skilled workers.

In each of the two sectors, we introduce retailers who buy the undifferentiated wholesale good for each sector, costlessly differentiate it, and face price stickiness à la Calvo. This creates two New Keynesian Phillips Curves. Furthermore, we introduce a cost-push shock that hits symmetrically both Phillips curves. This allows us to have a meaningful trade-off in the study of the optimal monetary policy problem. The supply side is completed by a final good producer in each sector that repackages the retail varieties with a CES aggregator.

Monetary policy. The central bank follows a Taylor rule. In the baseline calibration this is fully standard, with the central bank targeting CPI inflation and the output gap. However, when we move to optimal policy, we experiment with the central bank targeting a different mixture of inflation bundles, where we vary the weight on nnececessityty vs discretionary inflation. The linearized Taylor rule takes the form:

$$\widehat{R_t} = \rho^R \widehat{R_{t-1}} + (1-\rho^R)\left(\phi_\pi E_t\left(\widehat{\pi_{t+1}^{target}}\right) + \phi_Y \widehat{Y_t}\right) + \sigma^R \varepsilon_t^R$$

$$\widehat{\pi_{t+1}^{\text{target}}} = \phi_{\pi^D} \widehat{\pi_{t+1}^D} + \left(1-\phi_{\pi^D}\right)\widehat{\pi_{t+1}^N}$$

Where $\widehat{R}$ is the nominal interest rate, $\widehat{\pi_{t+1}^{target}}$ is the targeted inflation rate, $\widehat{Y}$ is the output gap, $\widehat{\pi_{t+1}^N}$ is the inflation rate of necessity goods and services, $\widehat{\pi_{t+1}^D}$ is the corresponding inflation rate for discretionary goods and services, with all variables in log deviations from the steady state. The Taylor rule parameters are the response to targeted inflation ϕ_π, the response to the output gap ϕ_Y, and the weight on discretionary spending inflation in the targeted inflation rate, ϕ_{π^D}. Targeting CPI inflation is achieved by setting this parameter equal to the economy wide share of the discretionary goods: $\phi_{\pi^D} = \overline{C^D}$. Finally, ρ^R governs the degree of interest rate smoothing and σ^R governs the volatility of the monetary policy shock.

Closing the model. We close the model with a tax and a profit rule as well as market clearing conditions for goods and labour markets.

Calibration. We take a standard calibration for the parameters that characterize the standard block of the model. η is consistent with the evidence of Christiano et al. (2010) and μ_L with the evidence of the average MPC in the Euro-area by Slacalek et al. (2020), Drescher et al. (2020), and Albacete et al. (2024). Smets and Wouters (2007) inform the average implied IES of 0.86 and are the source of the persistence of the cost push shock. β and ε are standard, ξ and σ^X are scaling parameters. The Calvo parameter θ implies a 9.14% frequency of price changes per month, consistent with the evidence for prices that we report in Table 1. The parameters associated with the novel parts of our framework, namely γ^N, $\gamma^D - \gamma^N$, α^N, $\alpha^D - \alpha^N$, ρ^R, σ^R, $\overline{C_H^N}$, $\overline{C_L^N}$ are borrowed from Andreolli, Rickard, and Surico (2024), who estimate them on U.S. data. In Appendix G, we summarize the full set of equilibrium conditions and implied impulse response functions.

Table 4
Calibration of Model Parameters

Description	Parameter	Value
IES for necessities	γ^N	0.216
IES difference for discretionaries	$\gamma^D - \gamma^N$	0.770
Low skilled share in necessities	α^N	0.028
Low skilled share difference in discretionaries	$\alpha^D - \alpha^N$	0.322
Price stickiness	θ	0.75
Time preference	β	0.99
Inverse of the macro Frisch elasticity	η	0.1
Dis-utility of working scaling parameter	ξ	1
Fraction of hand-to-mouth/low-skilled households	μ_L	1/3
Elasticity of substitution across varieties	ε	2
Steady state share of necessity good consumption (high-skilled)	$\overline{C_H^N}$	0.44
Steady state share of necessity good consumption (low-skilled)	$\overline{C_L^N}$	0.60
Attentive share of households	λ	0.014
Interest rate rule coefficient on targeted inflation	ϕ_π	1.5
Interest rate rule coefficient on output gap	ϕ_y	0.125

Interest rate rule coefficient on the necessity inflation as a share of total inflation	$1 - \phi_{\pi^D}$	0.4488
Interest rate smoothing	ρ_R	0.947
Standard deviation of the monetary policy shock	σ_R	0.255
Persistence of the cost-push shock	ρ_X	0.9
Standard deviation of the cost-push shock	σ_X	0.05

Sources: Authors calculations as described in the text.

Notes: The scaling parameter for the relative utility of discretionary goods (φ) and the relative productivity between necessity and discretionary good production ($a^N = \frac{A^N}{A^D}$) are computed using other parameters to match the steady state shares of nnecessityty good consumption for high- and low-skilled households.

6.2 Deriving a Welfare Criterion

The model is a helpful laboratory to study optimal policy as it features heterogeneity in many dimensions: households, goods, and sectoral composition, while remaining tractable and interpretable. We follow the standard approach in the literature, presented in Woodford (2003) and Galí (2015), and take a second order Taylor approximation of welfare to study the problem of the central bank devising simple rules to carry out monetary policy. We focus on the case of a *symmetric* cost-push shock that hits both sectors equally. We set the monetary policy shock to be zero in this exercise, as the central bank would induce unnecessary volatility by adding shocks to their behaviour.

Compared to representative agent models, where welfare is simply the discounted utility function of the representative agent, we need to take a stance on how to weight the utility of different households. To this end, we assume that the steady state is efficient, by setting profits equal to zero in steady state, thanks to an optimal subsidy, like in Bilbiie (2024), and we assume that Pareto weights are such that their multiplication with the marginal utility on necessity goods equals the population shares. This is akin to McKay and Wolf (2022) in the optimal monetary policy literature and to Heathcote and Tsujiyama (2021) in the optimal taxation literature. Intuitively, the second assumption implies that steady state heterogeneity is the domain of fiscal policy, and the central bank takes it as given (i.e. it does not enter its objective): the central bank cares only about cyclical fluctuations. Practically, it implies that the first order terms drop from the welfare function, leaving only the second order ones, as in the RANK literature, facilitating a comparison across the two classes of models.

In Appendix H, we show that the welfare function can be approximated in the following form:

$$-2\sum_{t=0}^{\infty}\beta^t \frac{W_t - W}{C} \approx$$

$$\sum_{t=0}^{\infty}\beta^t\left[a_{(\pi^N)^2}\left[\widehat{\pi_t^N}\right]^2 + a_{(\pi^D)^2}\left[\widehat{\pi_t^D}\right]^2 + a_{(C)^2}\widehat{C_t^2} + a_{(p^D)^2}\left(\widehat{p_t^D}\right)^2 + a_{(C,p^D)}\left(\widehat{p_t^D}\widehat{C}_t\right)\right] + t.i.p.$$

The main finding is that welfare decreases with: (i) higher inflation variability in either necessity or discretionary goods; (ii) higher variability in the output gap; (iii) a higher relative price of discretionary goods compared to necessity goods; (iv) a larger cross-product between the relative price and the output gap. Each of these variables is multiplied by a convolution of structural parameters. In Appendix H.1, we layout the derivations that lead to this approximated welfare. This loss function is reminiscent of Aoki (2001), Woodford (2003), Benigno (2004). By comparing the sum of $a_{(\pi^N)^2} + a_{(\pi^D)^2}$ with $a_{(C)^2}$, we can study the weight that inflation take relative to the output gap in the planner problem. This allows us to evaluate the relative weight on the output gap when we introduce additional sources of heterogeneity. Specifically, we start from a textbook version of a representative agent model similar to Woodford (2003), and then add: (i) Hand-to-Mouth households, (ii) sectoral heterogeneity, (iii) non-homotheticity in the utility function.

We use this laboratory to evaluate alternative policy rules, by computing variable moments and simulating the model under alternative scenarios. We vary the weight of discretionary spending inflation in the measure of inflation that the central bank targets. In the baseline model, the central bank targets headline CPI inflation by setting $\phi_{\pi^D} = \overline{C^D}$. We then vary ϕ_{π^D} from targeting only necessity inflation ($\phi_{\pi^D} = 0$) to only targeting discretionary inflation ($\phi_{\pi^D} = 1$). We perform the same analysis in our baseline model, with all the sources of heterogeneity turned on and then using a battery of restricted models that progressively turn off one dimension of heterogeneity at the time. Moreover, we focus only on simple deviations from an otherwise conventional Taylor rule, both for transparency and to give a readily available metric for policymakers to use.

It is important to note that in our model, we focus on *symmetric* cost-push shocks and *symmetric* price stickiness. This leads to a different focus of the existing literature which has either focuses on asymmetric disturbances (Guerrieri et al., 2021) or heterogeneous price stickiness (Aoki, 2001 and Benigno, 2004). A main contribution of our analysis is to show that even with symmetric shocks and symmetric nominal rigidities across sectors, we still find that the central bank should target sectors heterogeneously, due to the interaction between demand and sectoral composition.

7 Moving Away from Headline Inflation Targeting

In the previous section, we have derived an approximate welfare criterion based on our model with household expenditure heterogeneity and labour market heterogeneity across necessity and discretionary sectors. In this section, we show that the dynamics of discretionary spending imposes a substantial departure from the popular normative prescription of headline CPI inflation targeting. In particular, we show that monetary policy can achieve a superior outcome for society by targeting only discretionary spending inflation. The reason is that, in our model, movements in the overall output gap are driven by changes in the output gap of the discretionary sectors; this implies that the optimal monetary policy can close the output gap more effectively by stabilizing discretionary inflation. In the last part of this section, we evaluate how our findings change for different values of the interest rate sensitivity to targeted inflation in the Taylor rule, ϕ_π.

7.1 Targeting Only Inflation in Discretionary Spending

To elicit our main finding, we consider the optimal monetary policy implied by our model in the face of a cost push shock. More specifically, we show how the optimal monetary policy changes as a function of the weight in the Taylor rule on discretionary vs necessity inflation, ϕ_{π^D}, which we vary from 0 (i.e. targeting only necessity inflation) to 1 (i.e. targeting only discretionary inflation). For each model and value of ϕ_{π^D}, we then calculate the resulting welfare loss, as formulated in the previous section.

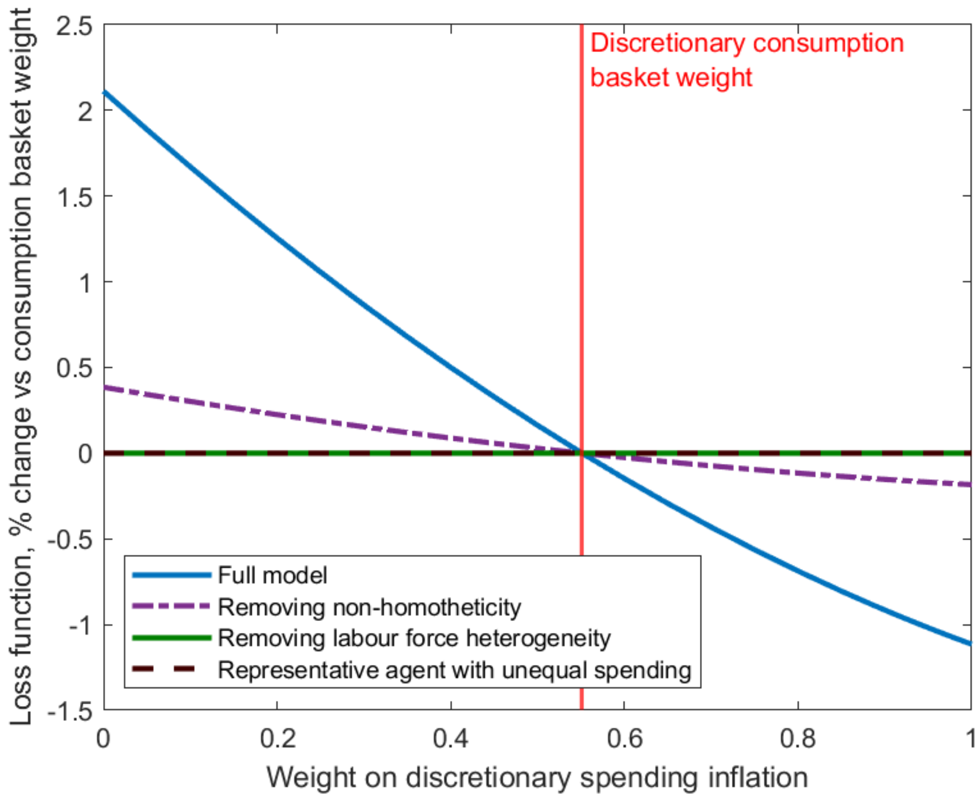
In Chart 7, we show the main finding of this exercise. The blue line corresponds to welfare loss percentage changes in the full model; it shows that the more the central bank tilts its target towards discretionary inflation the more welfare improves. This relationship is monotonic: the optimal policy in this model amounts to focus *exclusively* on discretionary inflation. Headline inflation targeting corresponds to the point of the vertical red line where the weight on discretionary inflation is equal to its consumption basket weight. Chart 7 reveals that headline inflation targeting is far from optimal within our framework. It is important to note that this result holds even though we have deliberately calibrated the level of price stickiness to be the same across sectors. In fact, as shown in Table 1, prices in the discretionary sectors tend to be less flexible for the Euro-area: in other words, more rigid prices would represent an additional motive to target only discretionary spending inflation. However, we emphasize that the novel motive that we uncover in this paper is independent, and conceptually distinct, from the well-known argument of targeting inflation in the sector with the higher degree of nominal rigidities.

The normative prescription of targeting only discretionary spending inflation stands in stark contrast to the findings from the restricted versions of our model, where we switch off some key heterogeneities. For instance, removing non-homotheticity (purple line) substantially dampens the benefits of discretionary inflation targeting. This suggests that increased concentration of HtM workers in a particular sector is only partly responsible for the welfare gains associated with targeting discretionary inflation; in fact, the interaction between the cyclicality of product demand and the cyclicality of labour demand in the discretionary sectors is critical for the conduct of monetary policy. Even more strikingly, removing the heterogeneity in sectoral labour force composition (green line), as well as removing HtM workers altogether (black broken line) implies that targeting sectors asymmetrically makes no difference to welfare. Taken at face value, under these latter restricted versions of the model, the central bank faces no trade-off in choosing whether to target discretionary, necessity or headline aggregate inflation. This latter finding hinges upon the fact that the inflation dynamics in the two sectors are identical. In the face of sector-specific shocks, however, this result from the restricted models would no longer hold.

Chart 7
Better to target discretionary spending inflation

Welfare loss for range of weight on necessity inflation

Including different model scenarios



Sources: Authors' calculations
Notes: Value of the welfare loss function, specified in text. This varies over the weight in the Taylor rule on necessity inflation (across the x axis) and for different model scenarios (different lines). All changes are relative to the loss at the necessity consumption basket weight (red vertical line) in each respective model.

One interpretation of the optimality of targeting only discretionary spending inflation is that the dynamics of business cycles are driven by the discretionary sector and, in particular, by the output gap in the discretionary sector. This is the component of spending that most affects the income of hand-to-mouth households and that therefore drives the amplification of the effects of monetary policy on aggregate consumption. It follows that closing the output gap in discretionary sector ---by targeting inflation in the discretionary sector--- helps mute these dynamics. This parallels the logic of the three equation New-Keynesian model with no heterogeneity and only one sector, in which inflation targeting is a direct (and fortuitous) consequence of closing the output gap.

7.2 The Case for a More Accommodative Monetary Policy Stance

One way to appreciate the finding in Chart 7 is to derive the value of the relative weight between inflation and the output gap in the welfare criterion associated with the different restricted versions as well as the full model. In Section 6.2, we have shown that the welfare loss function depends on the variance of the inflation and output gap, the relative prices and a cross-product term, though we have verified that the latter two terms carry a substantially smaller weight across a wide range of numerical calibrations. In this section, we show that the full model with heterogeneity in both spending and labour force composition across sectors places a much larger weight on the output gap relative to inflation compared to all other restricted specifications that remove key dimensions of heterogeneity. This is visible in Chart 8, which shows the ratio of the coefficients on the variance of output gap and inflation in the welfare loss function for both the full model and its restricted versions.

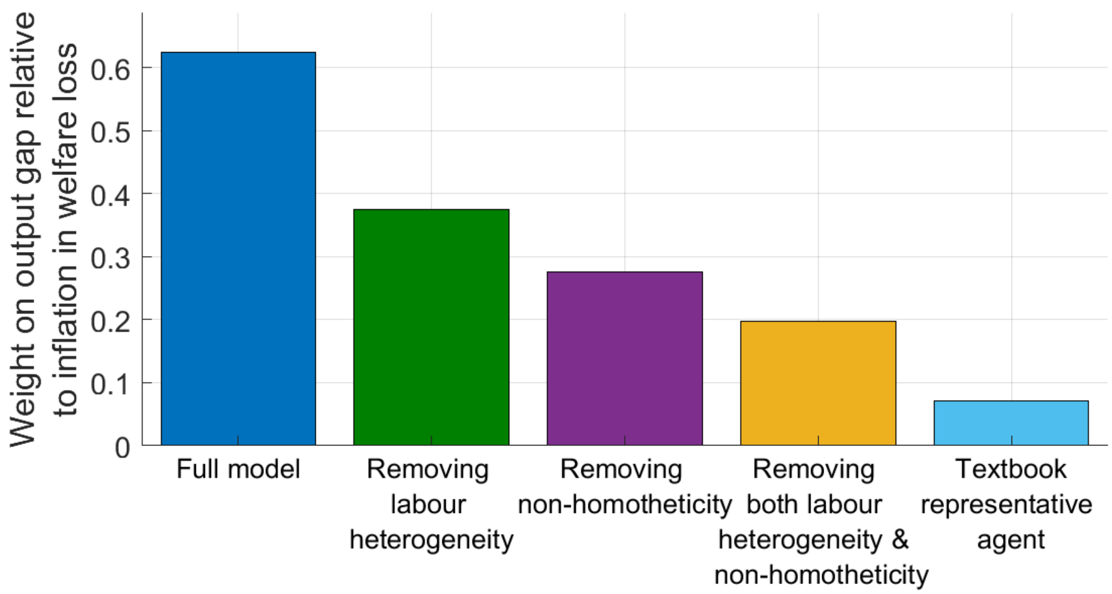
A main takeaway is that the full model implies a much larger focus on the output gap than any restricted version. For the simplest 'textbook' representative agent model, with no sectoral labour market heterogeneity, hand-to-mouth agents or non-homotheticity, the loss function weight on the output gap relative to inflation is only 0.07 (light blue bar): relatively low attention should be paid to the output gap. In contrast, under the full model, this weight is nearly 9 times larger, at 0.62 (dark blue bar). Each element of the model contributes to the increasing prioritisation of the output gap for policymaking, as shown by the intermediate bars.

Finally, it is worth emphasizing that a higher weight onto the output gap in the welfare loss function is not due to helping reallocation across sectors, which would happen in a model with sectoral heterogeneity and costly labour reallocation as Guerrieri et al. (2021). In our model, we have perfect labour mobility across sectors for any given skill level. Accordingly, our result is due to the interaction of discretionary spending being more cyclical and Hand-to-Mouth households working more prominently in the sectors producing discretionaries. We posit that if we were to introduce costly labour reallocation, this would push the optimal monetary policy towards even further monetary accommodation.

Chart 8
An output gap relative weight interpretation of discretionary inflation targeting

Given the nature of discretionary spending, optimal policy should place more weight on the output gap

Welfare function coefficients



Sources: Authors' calculations
Notes: Chart shows the relative weight on the output gap vs inflation. This is the weight on the variance of consumption in the welfare function in the main text, divided by the sum of the weights on necessity and discretionary inflation. The full model includes labour heterogeneity (low income disproportionately employed in discretionary sectors), non-homothetic preferences and hand to mouth households. The bars remove elements of these features, by setting relevant parameters equal to the aggregates or averages.

Another way to build the case for a more accommodative monetary policy stance is to evaluate how the welfare loss changes as one varies the weight of discretionary spending inflation in the Taylor rule for different values of the interest rate response to targeted inflation, ϕ_π. The findings of this exercise are shown in Chart 9, which summarizes the welfare loss changes in the full model when ϕ_π is equal to 1.5 (blue line), 2 (red dashed line) or 3 (black line), respectively. Each of these scenarios is normalised relative to the value of the welfare loss associated with the baseline parameterization ($\phi_\pi = 1.5$) under headline inflation targeting (i.e. the cross between the sloping blue curve and the vertical red line). To elicit the effects of changing the interest rate response to inflation in the Taylor rule, in all calculations of Chart 9, we set to zero the interest rate response to the output gap.

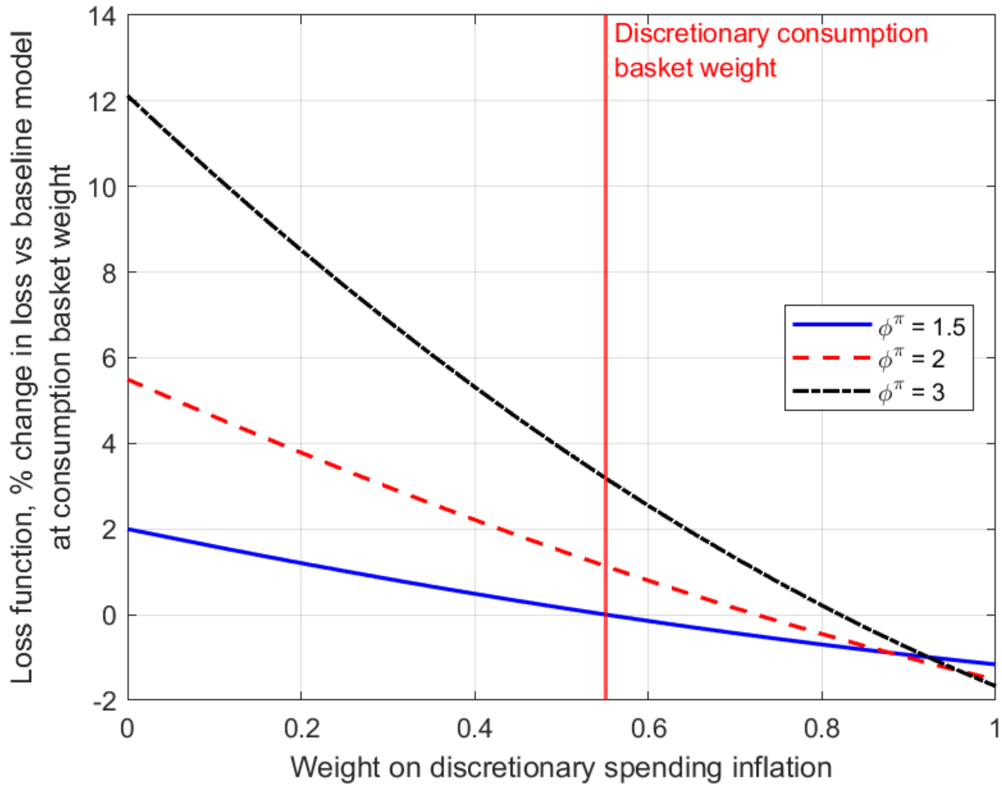
This exercise reveals several important clarifications regarding discretionary inflation targeting. Firstly, the benefits of discretionary inflation targeting are highly robust; across all these increasingly hawkish central bank policies (from $\phi_\pi = 1.5$ to $\phi_\pi = 3$), targeting discretionary inflation reduces welfare losses. Moreover, the welfare loss of about 1% that results from shifting from targeting headline inflation (i.e. $1 - \phi_{\pi^D}$=0.4488) to targeting discretionary inflation (i.e. $\phi_{\pi^D} = 1$), in the baseline model of $\phi_\pi = 1.5$, is similar in magnitude to a substantial hawkish shift in central bank policy, from ϕ_π = 1.5 to 2 along the vertical red line. This implies that the choice of what sectoral inflation rate to target has the same order of importance as how aggressively to target headline inflation.

It is worth noting that in our model, a more hawkish monetary policy stance worsens welfare; if we move vertically along the solid red line (i.e. targeting headline CPI inflation), the black short-dashed line is above the red dashed line, which in turn is above the solid blue line. The mechanism for this is similar to why the output gap carries a greater relative weight in the welfare criterion calculations of Chart 8. A more hawkish central bank stance would stabilise inflation; but this comes at the cost of greater output gap variation, which is highly costly and thus worsens welfare. This result contrasts with the conventional finding from the standard three equation representative agent New Keynesian model (e.g. Gali, 2015) that more aggressive inflation targeting improves welfare. In Appendix Chart A13, we show that a more hawkish stance is indeed beneficial in the most restricted version of our model with no heterogeneity. However, in the full model with both spending and labour market heterogeneity, the importance of increased output gap variability implies that it is typically better to take a more nuanced approach to inflation volatility. More generally, Chart 9 shows that targeting discretionary spending inflation has a fundamentally different impact on welfare relative to a more aggressive interest rate response to aggregate inflation.

Chart 9
Targeting discretionary inflation vs targeting headline inflation more aggressively

Targeting discretionary spending inflation is superior independently of the interest rate response to aggregate inflation

Relative loss for different necessity inflation weights vs aggregate inflation weights in the Taylor rule



Sources: Authors' calculations
Notes: Change (in %) of the welfare loss across different necessity inflation weights (across the x axis) and for different parameters on inflation in the Taylor rule. All changes are relative to the baseline Taylor rule inflation weight of 1.5 and at the necessity consumption basket inflation weight (red vertical line). Here, the corresponding weight on the output gap is set to zero for expositional clarity.

Finally, we would like to highlight that our result chimes with the idea that the central bank should target only a sub-set of the price index, akin to core inflation, but for completely different reasons. As shown in Appendix D2, core inflation weights more heavily on discretionary consumption categories and indeed the findings of this section support the notion that the central bank should target discretionary spending inflation. However, the main argument for targeting core inflation in the literature (e.g. Aoki, 2001) is to target the sector with stickier prices. In contrast, we have shown that the central bank should target discretionary inflation even in a set up with *symmetric* cost-push shocks and *symmetric* price stickiness across sectors. As such, our channel is very different from the traditional core inflation motive, driven by the interaction between Hand-to-mouth workers being disproportionately employed in the discretionary sector and non-essential industries being hit more severely in recessions. A main finding of our analysis is that luxury spending is easier to postpone not only by those who are sensitive to interest rate changes and move along the Euler equation, but also by those who lose their job and move along the Engel curve.

7 Conclusions

This paper introduces a novel analytical framework that distinguishes between necessity and discretionary economic activities to better understand business-cycle fluctuations and monetary policy transmission in the Euro-Area. Our empirical findings demonstrate substantial sectoral heterogeneity: discretionary industries exhibit greater sensitivity to monetary policy shocks in terms of consumer spending, employment, corporate profits, stock returns and dividend payments, while necessity sectors primarily respond to these shocks through price adjustments. Notably, discretionary sectors employ a higher proportion of hand-to-mouth workers, particularly at lower income levels, amplifying the impact of monetary policy on aggregate demand through employment dynamics. Furthermore, consumer prices in necessity sectors help predict Euro-area GDP, while employment rates in discretionary industries forecast HICP inflation, each outperforming aggregate indicators.

The implications for the design of monetary policy are significant. Our analysis suggests that the European Central Bank should prioritize stabilizing inflation in discretionary spending only, rather than adhering to headline inflation targets. The focus on discretionary inflation mitigates the adverse employment effects on vulnerable hand-to-mouth households in discretionary industries, stabilizing overall aggregate demand more effectively. Additionally, the granular dataset constructed for this study offers policymakers and researchers detailed, consistent, and methodologically robust time series on consumption, prices, employment, wages, and stock market performance within necessity and discretionary sectors. This rich empirical foundation provides a valuable tool for future policy evaluations and underscores the critical importance of sectoral analysis in enhancing the efficacy of monetary policy in the Euro-Area.

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Appendix A: Necessity and discretionary spending in national statistics

The UK Office for National Statistics (ONS) classifies COICOP 4-digit consumption categories into necessity (non-discretionary) and discretionary goods.[8] They define necessity expenditure as: "*Goods or services which are purchased because they meet a basic need (food, shelter, healthcare), are required to maintain current living arrangements (car maintenance, school fees), or are a legal obligation (compulsory insurance, Stamp Duty)*" , and discretionary expenditure as: "*Goods or services which could be considered "optional" purchases, for example, takeaway meals, alcohol and holidays*." **Table A1** displays in detail the classification of consumption categories. This classification aligns closely with the distinction made by Andreolli, M., Rickard, N. & Surico, P. (2024). which in turn follows a similar logic to the Engel curve-based categorization of Aguiar, M., & Bils, M. (2015).

Table A1
Classification of Necessity and Discretionary Consumption Categories

COICOP 4-digits

Classification	Categories
Necessity	Bread, breakfast cereals and other cereal products excluding cakes and biscuits, beef, veal, pork, lamb, goat, poultry and other meats, fish and other seafood, milk, cheese and eggs, oils and fats, fruit, vegetables, jams, honey and spreads excluding chocolate, confectionery and Ice-cream, food additives and condiments and other food NEC, coffee, tea and cocoa, rent, new dwelling purchase by owner-occupiers, maintenance and repair of the dwelling, water and sewerage, electricity, gas and other household fuels, property rates and charges, repair of household appliances, cleaning and maintenance products and other non-durable household products, pharmaceutical products, therapeutic appliances and equipment, medical and hospital services, dental services, hospital services, spare parts and accessories for motor vehicles, automotive fuel, maintenance and repair of motor vehicles, other services in respect of motor vehicles, rail fares excluding Eurotunnel fares, road transport including removals, postal services, telecommunication equipment and services, pets, related products pet food, veterinary and other services for pets, preschool, primary education and secondary education excluding tertiary education, canteens, personal care products, childcare, insurance, deposit, loan facilities direct charges and other financial services, other services.
Discretionary	Cakes and biscuits, chocolate, confectionery, Ice cream and other dairy products, waters, soft drinks and juices, spirits, wine, beer, tobacco, garments for men, garments for women, garments for infants and children, footwear for men, footwear for women, footwear for infants and children, accessories, cleaning, repair and hire of clothing and footwear, furniture, carpets and other floor coverings, household textiles, major household appliances, small electric household appliances, glassware, tableware and household utensils, tools and equipment for house and garden, other household services, motor vehicles, Eurotunnel fares, air fares, sea fares, audio, visual and computing equipment, audio, visual and computing media and services, major durables for in/outdoor recreation, games, toys and hobbies, equipment for sports, camping and open-air recreation, gardens, plants and flowers, sports participation, other recreational, sporting and cultural services, books, newspapers, magazines and stationery, international holiday travel and accommodation, cultural services, tertiary education, restaurant meals, takeaway and fast foods, domestic holiday travel and accommodation, hairdressing and personal grooming services, jewellery, clocks and watches, other personal effects.

Notes: The table reports the classification of COICOP-4digits consumption categories into necessity and discretionary consumption goods from the ONS.

[8] Office for National Statistics (ONS), released 4 December 2023, ONS website, article, [ONS household expenditure data: insights into the effects of costs of living pressures]

Appendix B: Data construction

B.1 Classification of necessity and discretionary consumption categories

We follow the ONS and classify consumption categories into necessity and discretionary goods. The ONS classification applies to COICOP 4-digits consumption categories, while in Eurostat consumption series are available at the COICOP 3-digit level of disaggregation, where each 3-digit category includes multiple 4-digit subcategories. We therefore classify COICOP 3-digit categories as necessity or discretionary, depending on the ONS classification of the majority of their 4-digit components.

For example, the category Food (CP011) is classified as a necessity because it includes the following necessity subcategories: *01.1.1: Bread and cereals; 01.1.2: Meat; 01.1.3: Fish; 01.1.4: Milk, cheese and eggs; 01.1.5: Oils and fats; 01.1.6: Fruit; 01.1.7: Vegetables; 01.1.9: Other food products, a*lthough it also includes discretionary items such as *01.1.8: Sugar and sweet products; 01.2.1: Coffee, tea and cocoa; 01.2.2: Mineral water and soft drinks*, the majority are classified as necessity goods.[3]

The category Transport Services (CP073) includes both necessity items—*07.3.1: Passenger transport by railway; 07.3.2: Passenger transport by road*—and discretionary items—*07.3.3: Air transport; 07.3.4: Water transport; 07.3.6: Other transport services*. This mixed composition makes direct classification difficult. To resolve this, we use UK data from the Consumer Trends dataset,[4] which reports household expenditures at the COICOP 4-digit level. We compute the share of necessity expenditure (i.e., railway and road transport) within the total Transport Services (CP073) category. Since this share is consistently below 50% across sample periods, we classify Transport Services (CP073) as discretionary. **Table A2** presents the classification of COICOP 3-digit consumption categories into necessity and discretionary groups. Note that some categories are available only at the 2 digits level of disaggregation in the first part of the sample (CP10, CP122_127). They are included as aggregate and both classified as discretionary, until they are available at the 3 digits level.

Table A2

Classification of COICOP 3-digits Categories

COICOP 3-digits

Classification	Categories
Necessity	Food, Actual rentals for housing, Imputed rentals for housing, Maintenance and repair of the dwelling, Water supply and miscellaneous services relating to the dwelling, Electricity, gas and other fuels, Medical products, appliances and equipment, Out-patient services, Hospital services, Operation of personal transport equipment, Postal services, Telephone and telefax equipment, Telephone and telefax services, Pre-primary and primary education, Secondary education, Post-secondary non-tertiary education, Personal care, Social protection, Insurance, Financial services n.e.c., Other services n.e.c.
Discretionary	Non-alcoholic beverages, Alcoholic beverages, Tobacco, Narcotics, Clothing, Footwear, Furniture and furnishings, Carpets and other floor coverings, Household textiles, Household appliances, Glassware, tableware and household utensils, Tools and equipment for house and garden, Goods and services for routine household maintenance, Purchase of vehicles, Transport services, Audio-visual, photographic and information processing equipment, Other major durables for recreation and culture, Other recreational items and equipment, Gardens and pets, Recreational and cultural services, Newspapers, books and stationery, Package holidays, Tertiary education, Education not definable by level, Catering services, Accommodation services, Prostitution, Personal effects n.e.c.

Notes: The table reports the classification of COICOP-3 digits consumption categories into necessity and discretionary consumption goods built from the ONS classification of COICOP 4-digits consumption categories.

B.2 Construction of Consumption and Prices Series

With our classification of consumption categories into necessity and discretionary goods, we construct time series for both necessity and discretionary consumption and prices for the Euro Area. Specifically, we build annual chain-linked volume indices of necessity and discretionary consumption following the ONS-Eurostat methodology.[9] To obtain quarterly year-on-year growth rates for the Euro Area, we interpolate the annual series using corresponding quarterly series derived from Italian and German data, which are available at a quarterly frequency.

For prices, we construct necessity and discretionary price indices following the methodology Eurostat uses for compiling the Harmonised Index of Consumer Prices (HICP), detailed in the "Handbook of prices and volumes in national accounts".

Annual Consumption Series

We collect annual series of household consumption expenditures at current prices (CP) and at previous year prices (PYP) for various 3-digit consumption categories from the Eurostat table "Final consumption expenditure of households by consumption purpose (COICOP 3-digit)" (table **nama_10_co3_p3**). Using these data, we construct chain-linked indices of necessity and discretionary consumption by aggregating CP and PYP values across necessity and discretionary categories and applying a chain-linking procedure with 2015 as the reference year. More specifically, we first construct:

$$CP_{\{E,y\}} = \sum_{\{i \in E\}} cp_{\{i,y\}} \;;\; PYP_{\{E,y\}} = \sum_{\{i \in E\}} pyp_{\{i,y\}}$$

with analogous expressions for discretionary goods. We then set the chain-linked volume in 2015 equal to the current price volume in that year, and recursively compute the chain-linked-volumes for all other years using:

$$CVM_{\{N,y\}} = CVM_{\{N,y+1\}} * \frac{CP_{\{N,y\}}}{PYP_{\{N,y+1\}}}$$

The same procedure is applied to discretionary consumption. Finally, we compute annual growth rates of the constructed chain-linked volumes.

Interpolated Quarterly Consumption Series

To obtain quarterly growth rates of necessity and discretionary consumption for the Euro Area, we interpolate their respective annual growth rates using data from Italy and Germany, for which quarterly figures are available. Specifically, we first construct quarterly series of necessity and discretionary consumption by aggregating data from these two countries. We then compute quarterly growth rates for necessity and discretionary consumption for the Euro Area by interpolating their respective annual growth rates using the quarterly growth rates derived from the Italian and German data. The quarterly data are sourced from the National Statistical Offices: data for Italy are obtained from ISTAT ("*Spesa per consumi finali delle famiglie per voce di spesa (Coicop 2018 3 cifre) e durata"),* and data for Germany are from the national accounts, which are available in DESTATIS.

Quarterly data are available at the COICOP 2-digit level, which is less granular than the 3-digit classification used in our annual series. We classify each COICOP 2 digits category based on the share of necessity and discretionary

[9] Details can be found here: https://www.ons.gov.uk/economy/nationalaccounts/uksectoraccounts/methodologies/chainlinkingmethodsusedwithintheuknationalaccounts and in Eurostat, (2013a), Handbook on Prices and Volume Measures in National Accounts.

consumption within each category in the annual series, considering only Italy and Germany and considering average shares throughout the sample period, spanning from 1995 to 2022. We classify as necessity the 2-digits consumption categories with an average share of necessity consumption greater or equal 50%, according to our classification of COICOP 3 digits categories, detailed above. Table A3 details the final classification of COICOP 2 digits categories into necessity and discretionary.

Table A3
Classification of COICOP 2-digits Categories

COICOP 2-digits

Classification	Categories
Necessity	CP01 Food and non-alcoholic beverages; CP04 Housing, water, electricity, gas and other fuels; CP06 Health; CP07 Transport; CP08 Information and communication; CP12 Insurance, Financial Services, Miscellaneous Goods and Services.
Discretionary	CP02 Alcoholic beverages, tobacco and narcotics; CP03 Clothing and footwear; CP05 Furnishings, household equipment and maintenance; CP09 Recreation, sport and culture; CP10 Education; CP11 Restaurants and accommodation services.

Notes: The table reports the classification of COICOP-2digits consumption categories into necessity and discretionary consumption goods built from our classification of COICOP 3-digits categories and expenditure shares in necessity and discretionary goods computed using Eurostat annual consumption data.

Two important details are worth noting. First, in the ISTAT data, the quarterly data are reported according to the COICOP 2018 classification, whereas our analysis is based on the COICOP 1999 classification. To ensure consistency, we aggregate the categories "Insurance and Financial Services" and "Personal Care, Social Protection and Misc Goods and Services" into CP12 - "Insurance, Financial Services, Misc. Goods and Services" aligning the data with the COICOP 1999 structure. Second, in the DESTATIS data, the categories CP09 “Recreation, sport and culture” and CP10 “Education” are only available as an aggregate. To maintain consistency with our disaggregated approach, we separate these categories using the average shares of CP09 and CP10 observed in the ISTAT data over the sample period.

ISTAT and DESTATIS provide data on nominal consumption expenditures at current prices (CP). To derive real expenditures (KP) for each COICOP category, we combine these nominal series with price data from Eurostat. Using this information, we compute expenditure at previous quarter prices (PQP) for each consumption category *i* as:

$$pqp_{\{i,t\}} = kp_{\{i,t\}} \times \frac{cp_{\{i,t-1\}}}{kp_{\{i,t-1\}}}$$

With both current price and previous quarter price expenditures available for each category, we construct quarterly chain-linked volume indices for necessity and discretionary consumption, applying the same methodology used for the annual series. We then compute year-on-year growth rates at the quarterly frequency by comparing each quarter with the same quarter in the previous year.

To obtain quarterly growth rates for the Euro Area, we interpolate the annual growth rates of necessity and discretionary consumption using the Chow-Lin interpolation method, under the assumption of a linear relationship between each annual growth rate and the average of the corresponding quarterly growth rates.

Monthly Prices Series

We collect price indices at the 3-digit COICOP level from the Eurostat table "HICP – monthly data (Index)" (*prc_hicp_midx*), considering indices normalized to 100 in the base year 2015. Corresponding item weights, used to aggregate price indices across consumption categories, are obtained from the Eurostat table "HICP-item weights" (*prc_hicp_inw*). To construct aggregate price indices, we first un-chain the individual category-level indices by dividing each monthly index by its value in December of the previous year. Specifically, we compute:

$$I_{\{i,m,y,unchained\}} = \frac{I_{\{i,m,y,chained\}}}{I_{\{i,12,y-1,chained\}}}$$

Next, we construct the unchained index of necessity prices as follows:

$$I_{\{N,m,y,unchained\}} = \sum_{\{i \in N\}} w_{\{i,m,y\}}\, I_{\{i,m,y,unchained\}}$$

where $w_{\{i,m,y\}}$ denotes the weights assigned to each consumption category *i*, and analogously for the index of discretionary prices. Finally, we obtain the chain-linked price indices by dividing each monthly unchained index by its value in December of the previous year, after initializing the chain-linked index to equal the unchained index in the first year of the sample (2002). For necessities this is:

$$I_{\{N,m,y,chained\}} = \frac{I_{\{N,m,y,unchained\}}}{I_{\{N,12,y-1,chained\}}}$$

and analogously for discretionary goods. Finally, the two price indices are de-seasonalized.

Durables, Non-Durables, Services and six ways split

We construct time series for consumption and prices of Durable, Non-Durable, and Services goods, following the same methodology used for the necessity/discretionary classification and grouping Semi-Durables together with Durables.

We follow the ONS classification of consumption categories into durables (& semi-durables), non-durables, and services. Also in this case, the ONS classifies COICOP 4-digit level codes, while Euro Area microdata is available at the COICOP 3-digit level. In cases where subcategories within a 3-digit COICOP code conflict in classification, we assign the category according to the majority classification of its subcomponents and take the classification which applies to the majority of the category. In several instances, this approach involves classifying expenditures on hire or repair services along with the main product category. This is applied to clothing, shoes, furniture, audiovisual equipment, household appliances, and major durables (COICOP categories 03.1, 03.2, 05.1, 05.3, 09.1, and 09.2). In other cases, we assign the overall classification based on the most significant subcategory. In particular, motor-vehicle ancillary products and maintenance (07.2) with motor vehicle fuels as a non-durable, personal care (12.1) as a service, printed materials (09.5) as non-durables, health-related products (06.1) as non-durable and recreational items (09.3) as semi-durable, maintenance and repair of the dwelling (04.3) into services, water supply and related services (04.4) into services, cleaning material and related services into non-durables (05.6).

For the latter, as it was most ambiguous, we use detailed UK expenditure data to determine the classification based on the majority of expenditure.

Once the COICOP 3-digit categories have been classified into Durable, Non-Durable, and Services groups, we construct annual consumption growth rates for the Euro Area using the same method as in the necessity/discretionary classification. We then interpolate these series at a quarterly frequency using data from Italy and Germany.
Similarly, we construct price indices for Durable, Non-Durable, and Services goods following the same procedure used for necessity/discretionary prices.

We repeat the same procedure by combining the classification of goods into Durables, Non-Durable, and Services, and the classification of goods into necessity and discretionary categories. Table A4 displays our classification of consumption categories into Durables, Non-Durable, and Services, each divided into necessity and discretionary categories. Notably, as in the construction of the baseline necessity and discretionary consumption series, we rely on data classified at the COICOP 2 digits level for the quarterly interpolation. We classify each of these categories into the 6 ways split resulting from the combination of Durables, Non-Durable, and Services, and necessity/ discretionary based on expenditure shares. When doing this, no COICOP 2-digit category is classified as necessity durable under our classification procedure—hence the resulting taxonomy includes five categories rather than six. The resulting categories are: necessity non-durables, necessity services, discretionary durables, discretionary non-durables, and discretionary services.
We then construct consumption and price series for each group following the same methodology used in the necessity/discretionary and durable/non-durable/services classifications.

Table A4
Classification of COICOP 3-digits Categories into 6 ways split

Classification	Durables & Semi-Durables	Non-Durables	Services
Necessity	Telephone and telefax equipment.	Medical products, appliances and equipment, Food, Operation of personal transport equipment, Electricity, gas and other fuels.	Post-secondary non-tertiary education, Other services n.e.c., Out-patient services, Imputed rentals for housing, Hospital services, Water supply and miscellaneous services relating to the dwelling, Personal care, Telephone and telefax services, Financial services n.e.c., Maintenance and repair of the dwelling, Insurance, Secondary education, Postal services, Social protection, Actual rentals for housing, Pre-primary and primary education.
Discretionary	Other recreational items and equipment, gardens and pets, Clothing, Other major durables for recreation and culture, Footwear, Glassware, tableware and household utensils, Audio-visual, photographic and information processing equipment, Purchase of vehicles, Personal effects n.e.c., Household appliances, Household textiles, Furniture and furnishings, carpets and other floor coverings, Tools and equipment for house and garden.	Alcoholic beverages, Non-alcoholic beverages, Tobacco, Narcotics, Newspapers, books and stationery, Goods and services for routine household maintenance.	Tertiary education, Transport services, Education not definable by level, Catering services, Recreational and cultural services, Prostitution, Prostitution; other services n.e.c., Package holidays, Education, Accommodation services.

Notes: Classification of COICOP 3 digits categories into necessity durables, necessity non-durables, necessity services, discretionary durables, discretionary non-durables, and discretionary services

B.3 Classification of Industries

We classify industries into those producing necessity and discretionary goods, following the methodology used in Andreolli, Rickard, Surico (2024). Eurostat provides data on employment at the NACE 2-digit level, which we adopt as our definition of industry. Accordingly, we classify each NACE 2-digit industry as either necessity or discretionary.

The classification proceeds in two steps. First, we distinguish between industries that produce final goods and those that produce intermediate goods. Final goods industries are manually classified as necessity or discretionary based on the nature of their output. Intermediate goods industries are classified using input-output analysis: we compute the Leontief inverse from the input-output table and assess each intermediate industry's contribution to the production of final necessity and discretionary goods.

Final Industries

The first step is to classify industries producing final and intermediate goods. We use the Eurostat Input-Output tables and examine the portion of each industry's output that goes into final consumption expenditure by households. More specifically, we use the *"Symmetric input-output table at basic prices (industry by industry)"* (**naio_10_cp1750**) from Eurostat. For each industry, we sum the output sold to other industries as intermediate input (excluding the output sold to the same industry) and the output sold directly to households (*"P3_S14: Final consumption expenditure by households"*), and compute the share of output sold directly to households out of this aggregate value. We classify industries as "Final" if they sell more than one-third of their value added to households, and the remaining ones as "Intermediate" industries.

We then manually classify these industries into necessity and discretionary categories based on the final goods they sell and our classification of the COICOP 3-digit consumption categories. The industry G47: Retail trade, except of motor vehicles and motorcycles, is a broad and important component of final consumption, and contains both necessity and discretionary consumption. We split this industry into two sub-industries, G47-necessity and G47-discretionary. After splitting G47 into two industries, out of the 62 resulting NACE Rev. 2 2-digit industries, 10 are classified as necessity, 19 as discretionary, and 33 are left as intermediate industries, to be classified through the Input-Output tables.

Intermediate Industries

We classify intermediate industries depending on the downstream final goods industries that they primarily supply to. This follows the same procedure as in Andreolli, Rickard Surico (2025), which the reader can refer to for a more detailed explanation of the procedure. We start from the input-output table, considering only the input-output linkages of 62 NACE Rev2-2digits industries both as suppliers and buyers of intermediate goods. We modify the original table to take into account the split of G47 into G47E and G47N. To do so, we use the necessity and discretionary expenditure shares of consumption categories contained within the retail trade industry. We manually classify the following consumption goods as sold in the retail trade industry: CP011:Food, CP012:Non-alcoholic beverages, CP021:Alcoholic beverages, CP022:Tobacco, CP031:Clothing, CP032:Footwear, CP051:Furniture and furnishings, carpets and other floor coverings, CP052:Household textiles, CP053:Household appliances, CP054:Glassware, tableware and household utensils, CP055:Tools and equipment for house and garden, CP056:Goods and services for routine household maintenance, CP061:Medical products, appliances and equipment, CP082:Telephone and telefax equipment, CP091:Audio-visual, photographic and information processing equipment, CP092:Other major durables for recreation and culture, CP093:Other recreational items and equipment, gardens and pets, CP095:Newspapers, books and stationery, CP121:Personal care, CP123:Personal effects n.e.c.. We then classify these consumption categories according to our necessity/discretionary classification, which results in 43% of retail trade being classified as necessity. We then split the retail trade category within the input-outut matrix into necessity and discretionary portions, based on this proportion of final consumption demand. This makes the assumption that the different input industries supplying retail trade are not differentially supplying necessity and discretionary final consumption - a strong assumption, but a reasonable benchmark. We then continue the same procedure, treating these new "Retail trade, necessity", and "Retail trade, discretionary" as separate industries.

We link each intermediate industry to the final products through the Leontief Inverse. Then, we compute the share of each industry that is sold to necessity, discretionary and unclassified industries. We assign an industry to necessity if this industry sells more to necessity final goods than discretionary final goods, and if the sum of these sales is at least one-third than the total sales of the industry. The outcome of this exercise is the classification in necessity and discretionary of the intermediate and final industries, defined via NACE 2 digits codes. Out of 62 industries, 20 are classified as necessity, 37 are classified as discretionary and 5 are left as unclassified. Table A5 displays our final classification of industries in detail.

Table A5

Classification of Industries into Necessity and Discretionary

NACE Rev 2- 2 digits Industries

Classification	Industries
Necessity	A01: Crop and animal production, hunting and related service activities; A03: Fishing and aquaculture; B: Mining and quarrying; C10-12: Manufacture of food products; beverages and tobacco products; C17: Manufacture of paper and paper products; C20: Manufacture of chemicals and chemical products; C21: Manufacture of basic pharmaceutical products and pharmaceutical preparations; C26: Manufacture of computer, electronic and optical products; D: Electricity, gas, steam and air conditioning supply; E36: Water collection, treatment and supply; G46: Wholesale trade, except of motor vehicles and motorcycles; G47E: Retail trade, except of motor vehicles and motorcycles; J61: Telecommunications; J62_63: Computer programming, consultancy, and information service activities; K65: Insurance, reinsurance and pension funding, except compulsory social security; K66: Activities auxiliary to financial services and insurance activities; M73: Advertising and market research; N77: Rental and leasing activities; Q86: Human health activities; Q87_88: Residential care activities and social work activities without accommodation.
Discretionary	A02: Forestry and logging; C13-15: Manufacture of textiles, wearing apparel, leather and related products; C16: Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials; C18: Printing and reproduction of recorded media; C22: Manufacture of rubber and plastic products; C23: Manufacture of other non-metallic mineral products; C24: Manufacture of basic metals; C25: Manufacture of fabricated metal products, except machinery and equipment; C27: Manufacture of electrical equipment; C28: Manufacture of machinery and equipment n.e.c.; C29: Manufacture of motor vehicles, trailers and semi-trailers; C31_32: Manufacture of furniture; other manufacturing; C33: Repair and installation of machinery and equipment; E37-39: Sewerage, waste management, remediation activities; F: Construction; G45: Wholesale and retail trade and repair of motor vehicles and motorcycles; G47N: Retail trade, except of motor vehicles and motorcycles; H49: Land transport and transport via pipelines; H50: Water transport; H51: Air transport; H52: Warehousing and support activities for transportation; H53: Postal and courier activities; I: Accommodation and food service activities; J58: Publishing activities; K64: Financial service activities, except insurance and pension funding; L68B: Real estate activities excluding imputed rents; M69_70: Legal and accounting activities; activities of head offices; management consultancy activities; M71: Architectural and engineering activities; technical testing and analysis; M74_75: Other professional, scientific and technical activities; veterinary activities; N78: Employment activities; N79: Travel agency, tour operator reservation service and related activities; N80-82: Security and investigation, service and landscape, office administrative and support activities; P: Education; R90-92: Creative, arts and entertainment activities; libraries, archives, museums and other cultural activities; gambling and betting activities; R93: Sports activities and amusement and recreation activities; S95: Repair of computers and personal and household goods; S96: Other personal service activities
Unclassified	C19: Manufacture of coke and refined petroleum products; C30: Manufacture of other transport equipment; J59_60: Motion picture, video, television programme production; programming and broadcasting activities; M72: Scientific research and development; S94: Activities of membership organizations.

Notes: The table reports the classification of NACE Rev. 2 2-digit industries into those producing necessity goods, discretionary goods, and unclassified industries. The classification is obtained by first distinguishing between final and intermediate industries. Final industries are manually classified, while intermediate industries are classified into necessity and discretionary based on input-output tables. Data are from Eurostat.

An additional complication is that, prior to 2008, Eurostat classified industries according to the NACE Rev. 1 classification, which differs from the NACE Rev. 2 classification and for which input-output tables are not available.

To overcome this obstacle, we manually match NACE Rev. 1 2-digit industries with their corresponding NACE Rev. 2 2-digit counterparts and assign to each NACE Rev. 1 industry the necessity or discretionary classification of the matched NACE Rev. 2 industry. If no clear match is available, we leave the industry unclassified. Note that, although statistical offices generally advise against matching NACE Rev. 1 and NACE Rev. 2 classifications due to limited correspondence between them, we find this issue less problematic at the 2-digit industry level, where an intuitive alignment between the two classification systems appears to exist, at least based on industry names and descriptions. In addition, we only want to ensure consistency of classification into discretionary and necessity, which is a less onerous requirement than seeking exact matches between industries NACE Rev 1 and 2. Out of 62 NACE Rev. 1 2-digit industries, we classify 22 as producing necessity goods, 29 as producing discretionary goods, and leave the remaining 11 unclassified. Table A6 displays our final classification of NACErev1 2-digits industries in detail.

Table A6

Classification of Industries into Necessity and Discretionary

NACE Rev 1- 2 digits Industries

Classification	Industries
Necessity	A01: Agriculture, hunting and related service activities; B05: Fishing, fish farming and related service activities; CA10: Mining of coal and lignite; extraction of peat; CA11: Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying; CA12: Mining of uranium and thorium ores; CB13: Mining of metal ores; CB14: Other mining and quarrying; DA15: Manufacture of food products and beverages; DA16: Manufacture of tobacco products; DE21: Manufacture of pulp, paper and paper products; DG24: Manufacture of chemicals and chemical products; DL30: Manufacture of office machinery and computers; E40: Electricity, gas, steam and hot water supply; E41: Collection, purification and distribution of water; G51: Wholesale trade and commission trade, except of motor vehicles and motorcycles; G52E: Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods; I64: Post and telecommunications; J66: Insurance and pension funding, except compulsory social security; J67: Activities auxiliary to financial intermediation; K71: Renting of machinery and equipment without operator and of personal and household goods; K72: Computer and related activities; N85: Health and social work.
Discretionary	A02: Forestry, logging and related service activities; DB17: Manufacture of textiles; DB18: Manufacture of wearing apparel; dressing; dyeing of fur; DC19: Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear; DD20: Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials; DE22: Publishing, printing and reproduction of recorded media; DH25: Manufacture of rubber and plastic products; DI26: Manufacture of other non-metallic mineral products; DJ27: Manufacture of basic metals; DJ28: Manufacture of fabricated metal products, except machinery and equipment; DK29: Manufacture of machinery and equipment n.e.c.; DL31: Manufacture of electrical machinery and apparatus n.e.c.; DM34: Manufacture of motor vehicles, trailers and semi-trailers; DN36: Manufacture of furniture; manufacturing n.e.c.; DN37: Recycling; F45: Construction; G50: Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel; G52N: Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods; H55: Hotels and restaurants; I60: Land transport; transport via pipelines; I61: Water transport; I62: Air transport; I63: Supporting and auxiliary transport activities; activities of travel agencies; J65: Financial intermediation, except insurance and pension funding; K70: Real estate activities; M80: Education; O90: Sewage and refuse disposal, sanitation and similar activities; O92: Recreational, cultural and sporting activities; O93: Other service activities.
Unclassified	DF23: Manufacture of coke, refined petroleum products and nuclear fuel; DL32: Manufacture of radio, television and communication equipment and apparatus; DL33: Manufacture of medical, precision and optical instruments, watches and clocks; DM35: Manufacture of other transport equipment; K73: Research and development; K74: Other business activities; O91: Activities of membership organization n.e.c.; P95: Activities of households as employers of domestic staff; P96: Undifferentiated. goods producing activities of private households for own use; P97: Undifferentiated services producing activities of private households for own use; Q99: Extra-territorial organizations and bodies.

Notes: The table reports the classification of NACE Rev. 1 2-digit industries into those producing necessity goods, discretionary goods, and unclassified industries. The classification is obtained by manually matching Nace rev-2 2 digits industries with corresponding Nace Rev 1 2 digits industries, and then applying our classification of necessity/discretionary/unclassified industries.

B.4 Employment

With our classification of industries at hand, we construct quarterly series of employment in industries that produce necessity and discretionary consumption goods in the Euro Area. Data on industry level employment is from the Eurostat-Labor Force Survey Dataset. We use the table *"Employment by sex, age and detailed economic activity (1998-2008, NACE Rev. 1.1 two digit level) - 1 000"* (**lfsq_egana2d**), which contains data until 2008 classified according to the NACE Rev 1 industries, and the table *"Employment by sex, age and detailed economic activity (from 2008 onwards, NACE Rev. 2 two digit level) - 1 000"* (**lfsq_egan22d**), which contains data until 2008 classified according to the NACE Rev 1 industries.

Employment in the retail trade sector—corresponding to G52 in NACE Rev. 1.1 and G47 in NACE Rev. 2—is split into employment in retail-necessity and retail-discretionary activities. This division is based on the same consumption expenditure shares used in the input-output tables, with 43 percent of retail trade employment allocated to necessity goods. We then construct total employment in the necessity sector as the sum of employment in all industries classified as necessity producers, including the appropriate share of retail trade, and analogously for the discretionary sector.

Employment series prior to 2008 are available only for a subset of NACE Rev. 1.1 industries. To avoid a discontinuity in our employment series at the 2008 classification change, we compute the ratio of total employment in necessity (discretionary) sectors in 2008 as reported under the NACE Rev. 2 classification to that under the NACE Rev. 1.1 classification, and we use this ratio to rescale the corresponding employment series prior to 2008. For some countries, employment data are available only under the NACE Rev. 2 classification in 2008. In these cases, we use the 2007 values from the NACE Rev. 1.1 classification to compute the adjustment ratio. Moreover, between 2003 and 2005, employment data for the Euro Area (EA20) are available only at annual frequency, and no data are available prior to 2003. To extend the quarterly series backwards, we use year-over-year growth rates in employment from a subset of countries (Austria, Belgium, Greece, Spain, Finland, Italy, Portugal, Slovenia, and Slovakia) for which quarterly data are available since 1999. We apply these growth rates in reverse to interpolate quarterly employment in the earlier period.

We also construct employment rate series for necessity and discretionary sectors by dividing the respective employment totals by the total Euro Area population, obtained from Eurostat (**lfsq_pganws**). Finally, the resulting employment rate series are seasonally adjusted

B.5 Share of Hand-to-Mouth Workers in Necessity and Discretionary Industries

We compute the share of Hand-to-Mouth households working in necessity and discretionary sectors along the income distribution in the Euro Area, using data from the ECB Household Finance and Consumption Survey (HFCS). We follow the methodology of Slacalek, Tristani and Violante (2015) and Kaplan et al (2014), to define Hand-to-Mouth households using the HFCS. Similarly to them, we use wave 2 of the HFCS. A household is considered as hand-to-mouth if:

- Net Liquid Wealth ≥ 0 AND Net Liquid Wealth ≤ biweekly income OR
- Net Liquid Wealth < 0 AND Net Liquid Wealth ≤ biweekly income - credit limit.

In the HFCS, the variables above are defined as follows:

- Net Liquid Wealth: Liquid Assets - Liquid Liabilities, where:

1. Liquid Assets = sight and saving accounts (deposits), directly held mutual funds, bonds and stocks = da2101 + da2102 + da2103 + da2105,
2. Liquid Liabilities = overdraft debt and credit card debt = dl1210 + dl1220.

- Income: di2000,
- Credit Limit is assumed to be one month of income.

In the HFCS, industry of employment is reported at the NACE 1-digit level. To classify these broader categories, we compute the share of employment within each NACE 1-digit industry that falls into necessity, discretionary and unclassified NACE 2-digit industries, based on our prior classification. We then assign each NACE 1-digit industry to one of the three groups—necessity, discretionary, or unclassified—according to the category with the highest average employment share over time. Using this classification, we compute the share of hand-to-mouth (HTM) households employed in necessity and discretionary, both for the entire sample and within each quintile of the distribution of income in the Euro Area. income quintile.

B.2 Stock Prices & Dividends

We construct time series of necessity and discretionary stock prices using data from Eikon, following a methodology broadly aligned with that used to construct the EURO STOXX 600 Index, which is detailed in the *STOXX® Calculation Guide*. For each date in our sample, we extract from Eikon the list of EURO STOXX 600 constituents, along with each firm's cum-dividend and ex-dividend opening and closing prices (in Euro), the number of free-float market shares, and the NACE industry classification. In addition, for all dates involving changes in index composition—either due to official index reviews or other updates to membership—we record the identities and industry classifications of entering and exiting firms. We then classify each of these dates as involving a rebalancing of necessity stocks, discretionary stocks, or both.

With these data at hand, we construct pseudo stock price indices for necessity and discretionary industries. For necessity stocks, we compute the free-float market capitalization as:

$$M_t^N = \sum_{\{i \in S_{\{n,t\}}\}^{p}_{\{i,t\}}} ff_{\{i,t\}}$$

Where $p_{i,t}$ are ex-dividend close prices, $ff_{i,t}$ is the number of free float shares and $S_{n,t}$ is the set of stocks *i* in the EUROSTOXX600 at time *t* that belong to the necessity category. We follow the same procedure for discretionary stocks.

To compute the index, we construct a divisor, which serves as a rescaling factor to ensure continuity in the index level over time. The divisor is adjusted to account for changes in index composition that are not driven by market fundamentals—such as the entry or exit of firms—thus preventing artificial jumps or drops in the index. Unlike the official EURO STOXX 600 methodology, we do not adjust for corporate actions (e.g., dividends, stock splits, or mergers), and instead focus solely on composition changes. While this omission does not affect our analysis of stock price dynamics per se, it could, in principle, distort the level of the index. However, as long as these effects are not systematically different between necessity and discretionary sectors, they should not bias our results. Moreover, using our methodology for the divisor—which ignores corporate actions—we obtain an aggregate stock index that correlates 96.7% with the EURO STOXX 600, giving us confidence that this approach does not introduce significant errors.

The divisor for the necessity stock price series at each time period is computed as:

$$D_{t+1}^{N} = D_{t}^{E} \frac{M_{t+1}^{N}}{M_{t}^{N}}$$

when the index is rebalanced and remains equal to the previous period if the index is not rebalanced. In the above expression M_{t+1}^{N} is the market capitalization of necessity EUROSTOXX 600 constituents at time t+1, calculated using opening prices, and M_{t}^{N} is the market capitalization at time t, calculated using closing prices. Rebalancing occurs only on dates involving changes in the composition of necessity firms (or both necessity and discretionary firms). The necessities stock price index is then computed as:

$$I_{t}^{N} = \frac{M_{t}^{N}}{D_{t}^{N}}.$$

The same procedure is applied to compute the divisor for the discretionary series.

We also construct three dividend series—aggregate, necessity, and discretionary—for the Euro Area. Consistent with the approach outlined above, we construct these dividend series based on the full set of EUROSTOXX 600 constituents, distinguishing between firms belonging to necessity and discretionary industries. Specifically, we aggregate the cash dividends distributed quarterly by each group of firms. To derive quarterly dividends, we evenly distribute the cumulative annual dividends paid by each firm across all quarters within each fiscal year.

B.2 National Accounts Data

The series for Gross Value Added, Compensation of Employees, Wages and Salaries and Operating Surplus are constructed from the national accounts, using a combination of annual and quarterly national accounts, from Eurostat. We use the gross value added (chained level) and current price compensation of employees and wages and salaries series. For annual data, the series are available at the Rev 2 level, and we classify industries in the same way as for the employment data. As some industry data are classified for certain countries (particularly Ireland) we aggregate up from EA20 country level data, excluding entirely any industry-country pairs which are ever classified and redacted in the national accounts data, to keep the series consistent. The value of the excluded industries is very small compared to the aggregated EA20 series. For the quarterly series, data are available at the more aggregated 1 digit level. We use the seasonally and calendar adjusted industry series for the same variables. To produce quarterly series, we use the annual series (averaged over the entire sample) to compute the average nnececessityty share in each 1 digit industry, and construct necessity and discretionary quarterly series using this necessity share. We then interpolate the annual series using the quarterly series, using the same Chow-Lin procedure as the consumption data. Once interpolated, we construct levels using the same procedure as for consumption, starting the index in 1995q4 at the 1995 level, and then using the y/y quarterly growth rates, divided by 4 to cumulate to an index. For all series, we do this procedure on nominal values and then deflate the final quarterly series using euro area HICP. Note that GVA is available as a real (chained volume) measure; we use the nominal value and deflate using HICP to keep the resulting real series consistent with other national accounts series. One implication of this is the nominal series and series deflated using alternative deflators would have identical relative changes between overall/necessity/discretionary sectors.

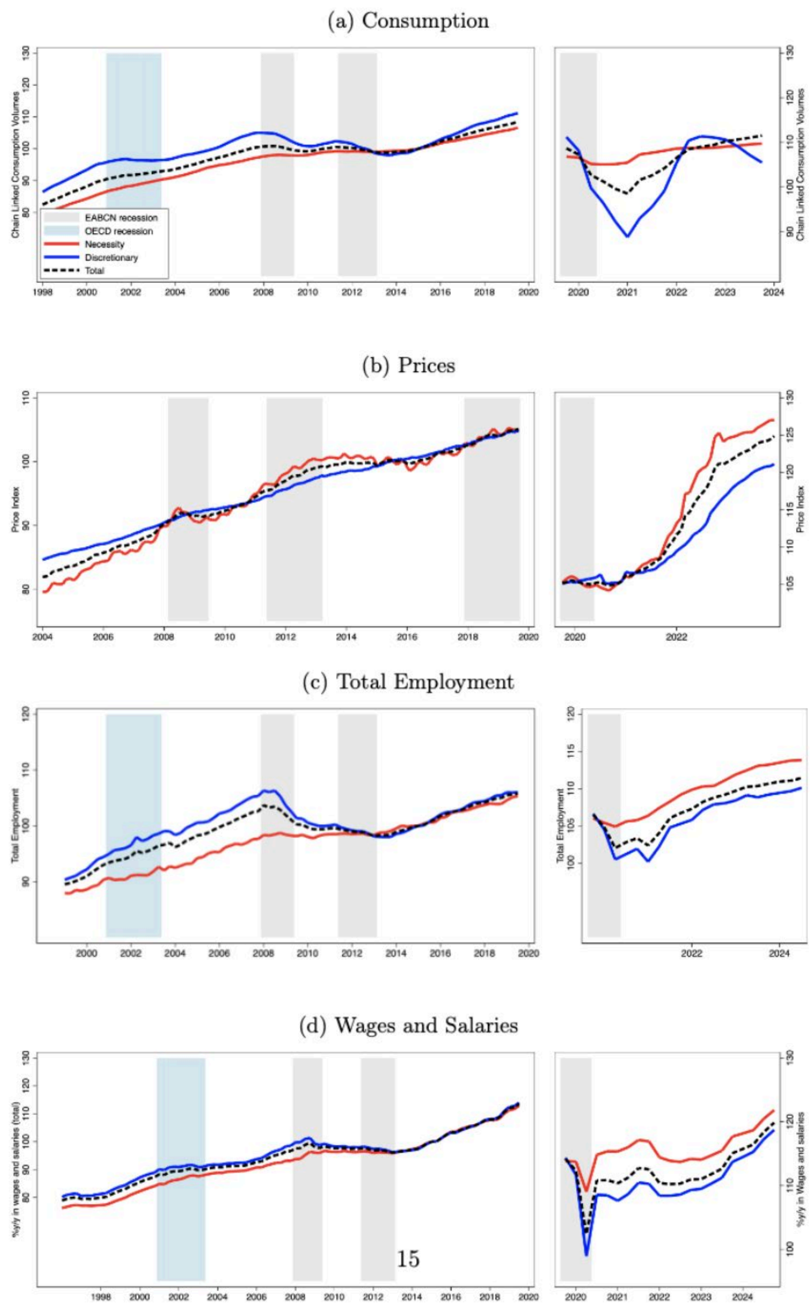
Appendix C: consumption, prices, employment and wage indices for sectors producing necessity and discretionary goods and services.

In Chart A1, we plot indices for consumption, prices, employment, and wages and salaries, rather than the annual growth rates used in Chart 1. One complication is that, for consumption, we only have quarterly growth rates available, as we interpolate annual Euro Area data from Eurostat using quarterly growth rates from Italy (Istat) and Germany (Destatis). To construct quarterly indices, we set the index equal to 100 in 2015Q1 and iteratively apply one-quarter of the annual growth rate forward and backward to derive level values for each quarter. This approach should not amplify the observed business cycle patterns; instead, if anything, it should smooth the consumption series. Lastly, we plot wages and salaries derived from the national accounts rather than negotiated wages, as we only have growth rate indices available for the latter. Similarly, in chart A2 we plot the indices of gross value added, operating surplus, and compensation of employees in levels, as opposed to the corresponding annual growth rates plotted in Chart 2.

Chart A1

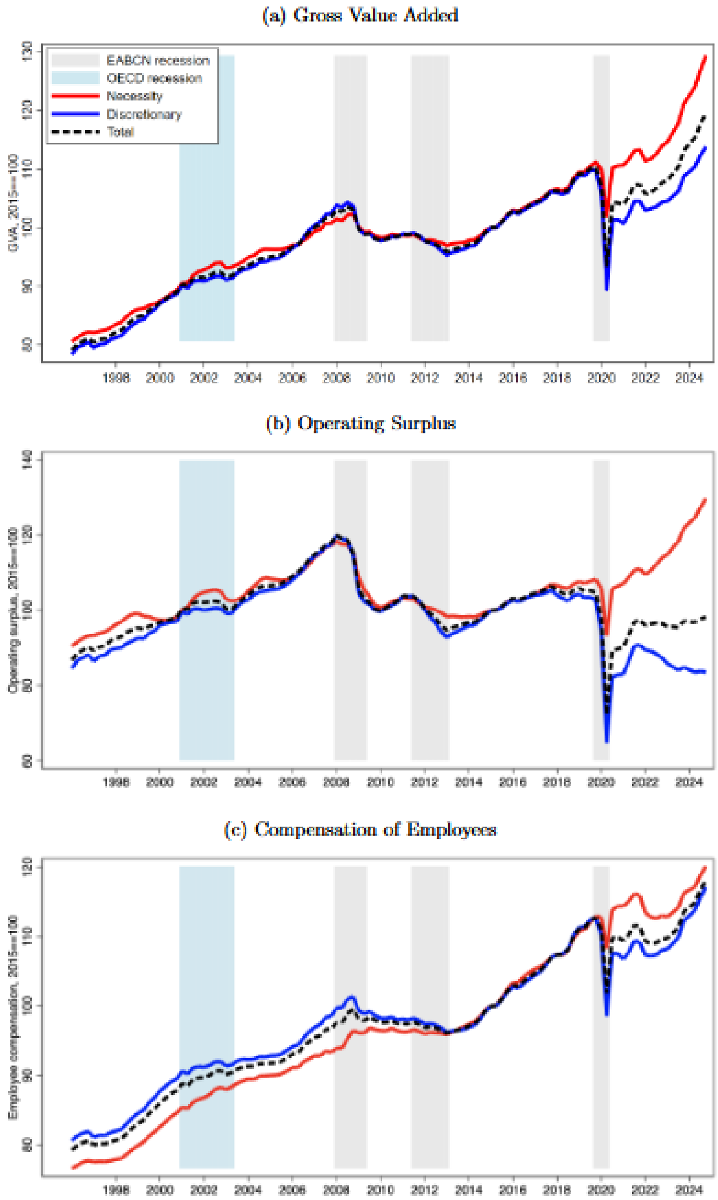
Consumption, Inflation, Employment and Wages

Indices



Sources: All series are derived from Eurostat quarterly, annual National Accounts and the ECB wage tracker.
Notes: The figure presents the evolution over time of consumption, inflation, employment rate, and wages and salaries, both in aggregate and disaggregated into necessity and discretionary goods and industries. All series are indexed to 100 in 2015. See the Appendix for details on data construction.

Chart A2
Operating surplus



Sources: All series are derived from Eurostat quarterly, annual National Accounts.
Notes: GVA, Operating Surplus and Employee compensation, both in aggregate and disaggregated into necessity and discretionary industries. All series are real and indexed to 100 in 2015.

Appendix D: non-durables, services and durables & core vs non-core prices

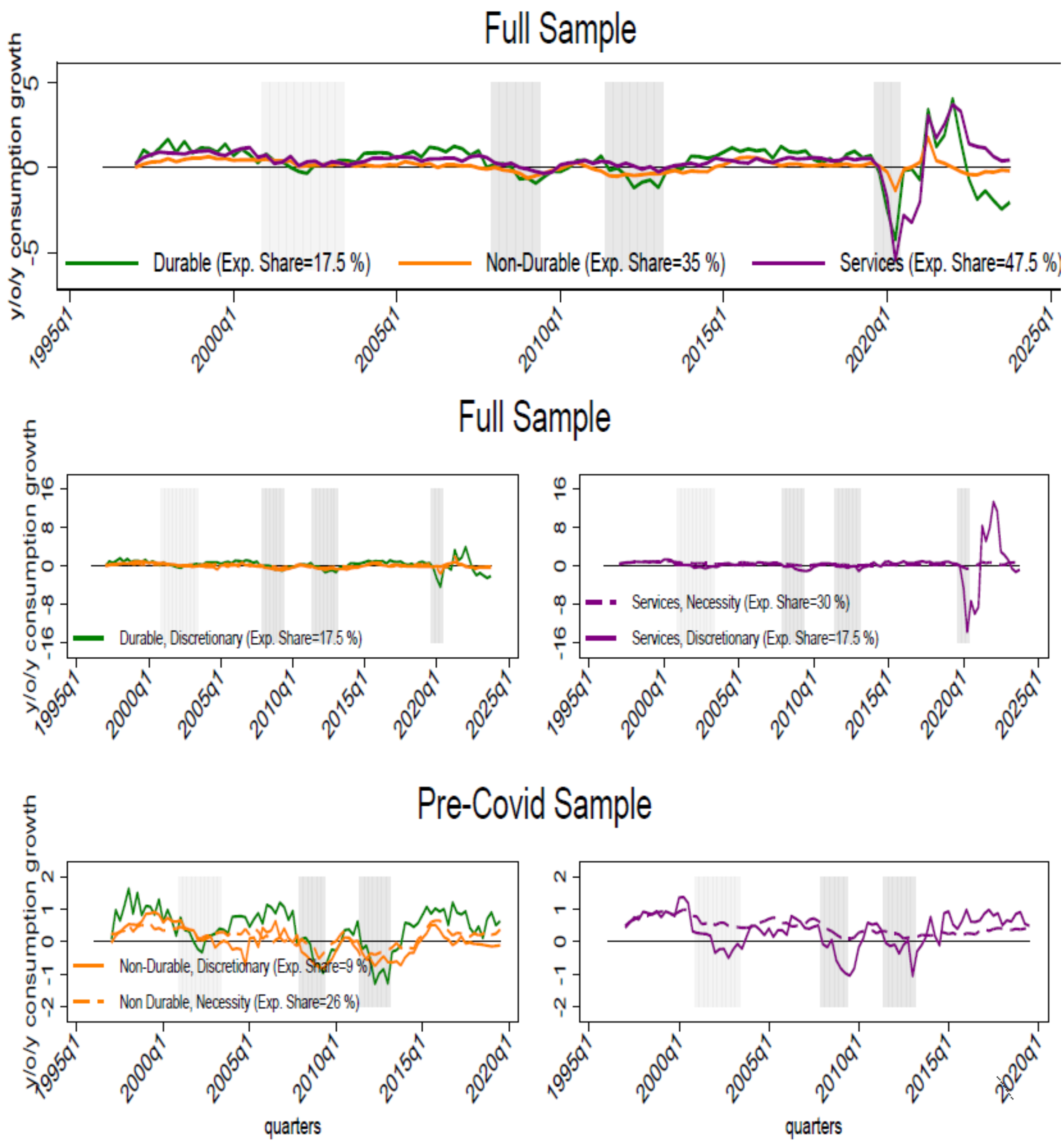
D.1 Non-durables, services and durables

In Chart A3, we plot annual consumption growth rates for durables, non-durables, and services (top panel), as well as separately for necessity and discretionary goods within these categories in the middle and bottom panels. The middle panel covers the entire sample period, while the bottom panel specifically focuses on the pre-COVID period, ending in 2019Q4. It is noteworthy that discretionary services exhibit volatility comparable to discretionary durables, with discretionary non-durables ranking third in volatility. Conversely, necessity goods consistently display low volatility across all durability categories.

In Chart A4, we plot annual growth rates for HICP-like price indices of durable goods, non-durable goods, and services in the top panel. The middle and bottom panels present annual growth rates for necessity and discretionary goods separately within these durability categories. As before, the middle panel spans the entire sample period, while the bottom panel focuses specifically on the pre-COVID period, ending in 2019Q4. Notably, necessity non-durable prices exhibit the highest volatility, consistent with the fact that this category includes food and energy components.

Chart A3

Consumption in Durables, non-Durables and Services, split by Necessity/Discretionary

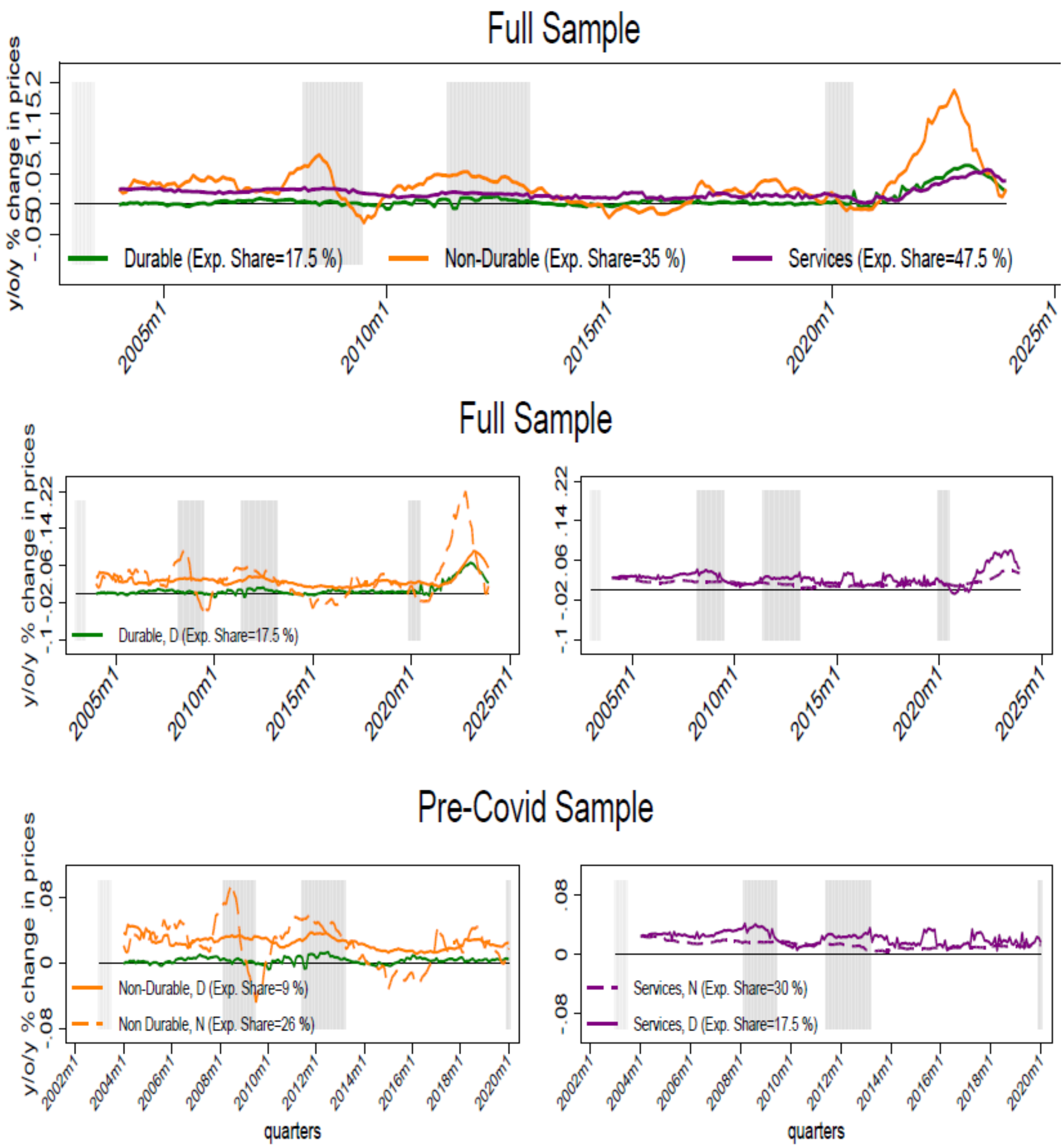


Sources: Data are sourced from Eurostat, Istat, and Destatis.

Notes: The figure shows the annual growth rates of consumption in durables, non-durables, and services in the top panel. The two middle panels display the breakdown into essential and discretionary categories, while the bottom panel provides a closer look at the pre-COVID period. Semi-durables are grouped together with durables. See the Data Appendix for details on the construction of the series.

Chart A4

Prices of Durables, non-Durables and Services, split by Necessity/Discretionary



Sources: Data are sourced from Eurostat & Istat & Destatis.

Notes: The figure shows the annual growth rates of the prices indices of durables, non-durables, and services in the top panel. The two middle panels display the breakdown into necessity and discretionary categories, while the bottom panel provides a closer look at the pre-COVID period. Data are sourced from Eurostat, Istat, and Destatis. See the Data Appendix for details on the construction of the series.

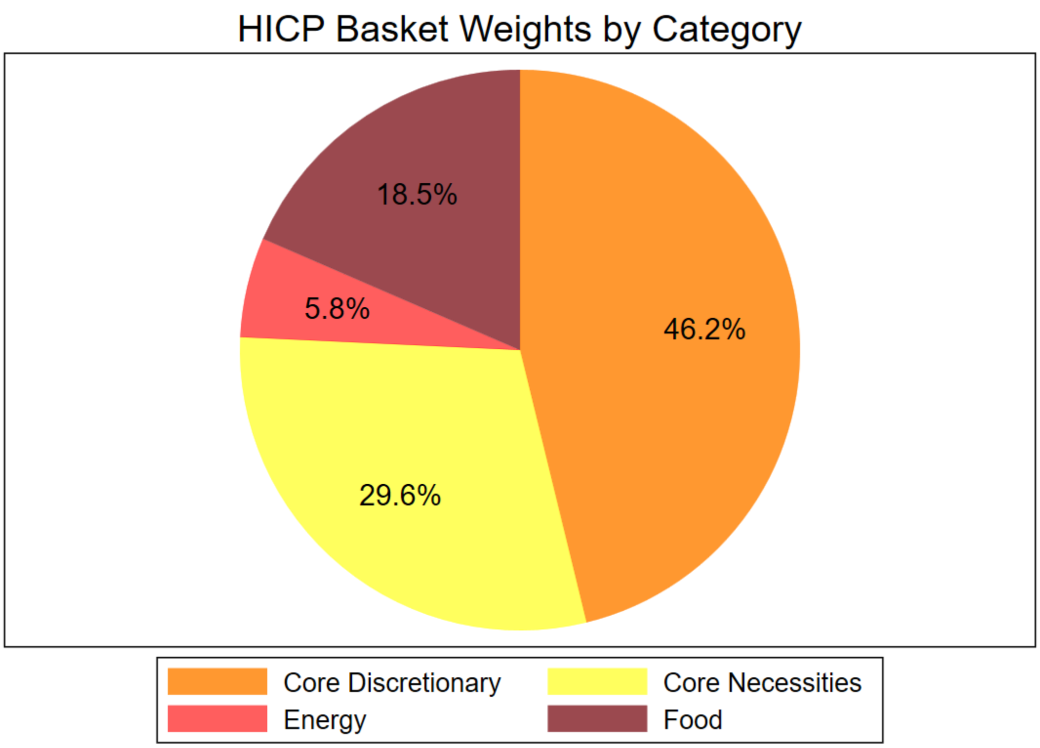
D.2 Core & non-core prices

Our evidence indicates that prices of necessity goods are more pro-cyclical and exhibit a stronger response to monetary policy shocks compared to discretionary goods. However, necessity goods encompass energy and food, whose prices are notably volatile and often influenced by temporary supply-side shocks that monetary policy cannot easily mitigate in the short term. Although the ECB's mandate is to maintain stability in headline inflation, policymakers look past these volatile components and emphasize core inflation when making policy decisions. Therefore, in this section, we investigate whether the observed variation in necessity prices is solely driven by fluctuations in energy and food prices or whether core necessity prices also significantly contribute. Additionally, we compare this variation with that observed in core discretionary prices.

We begin by examining the contribution of core necessity goods to the overall HICP basket. Chart A5 shows the average basket weights in the HICP for energy (CP045), food (CP011 and CP012), core necessity, and core discretionary goods. The core necessity and discretionary categories include all remaining COICOP items, classified according to our necessity/discretionary framework. The reported weights are averages calculated over the entire sample period from 1996 to 2023. Necessity goods represent 53.9% of the total HICP basket, with core necessity items accounting for approximately 54% of this necessity category.

Chart A5

HICP basket weights of energy, food, core-necessity and core-discretionary consumption items.



Sources: Eurostat and authors' calculations.

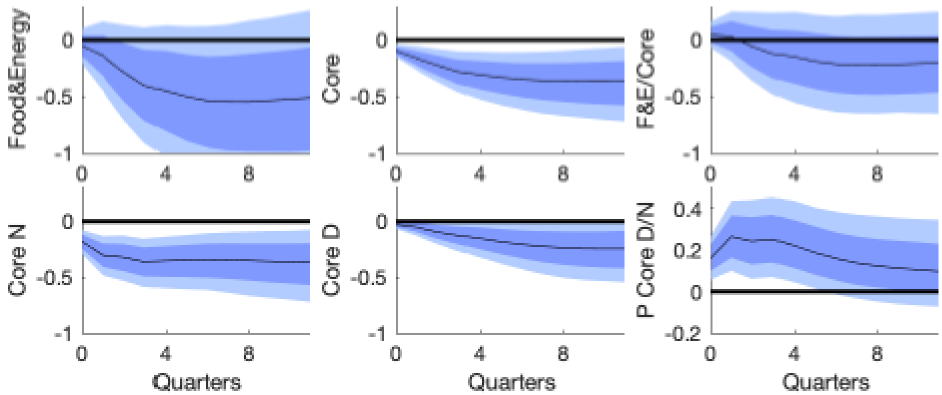
Notes: The figure displays the HICP weights of energy, food, core necessity and core discretionary consumption goods. Energy corresponds to the COICOP 3 digits code CP045, food corresponds to the COICOP 3 digits codes CP011 & CP012. The rest of the COICOP codes are split into core-necessity and core-discretionary based on our classification of COICOP 3 digits categories into necessity and discretionary. HICP weights are displayed as averages across years over the sample period from 1996 to 2023.

Having established that core necessity goods represent a substantial share of the necessity category within the HICP, we now examine how the prices of energy and food, overall core prices, and specifically core necessity and discretionary prices respond to monetary policy shocks. To perform this analysis, we employ our baseline BVAR model and identification strategy. Chart A6 reports the IRFs estimated over the full sample period (1999Q1–2024Q2), while Chart A7 presents analogous results estimated on the pre-COVID sample (1999Q1–2019Q4). In both samples, the response of core necessity prices is statistically significant and similar in magnitude to that observed for food and energy prices. Importantly, the greater responsiveness of necessity prices relative to discretionary prices persists even after excluding food and energy components. This pattern is clearly reflected both in the individual IRFs for necessity and discretionary prices and in the IRF of the discretionary-to-necessity price ratio.

Our findings contrast with those reported by Allayioti, Górnicka, Holton, and Martínez Hernández (2024), who find that discretionary item prices respond more strongly to monetary policy shocks. However, our methodology differs substantially from theirs. Specifically, we first aggregate the prices of necessity and discretionary goods into two HICP-like series that incorporate basket weights, and then estimate impulse responses of these aggregated series to monetary policy shocks. In contrast, their approach involves estimating item-specific BVAR models individually for each of the 72 consumer prices included in the HICP, subsequently classifying items according to their sensitivity to monetary policy shocks. They conclude from this analysis that the individual items exhibiting greater sensitivity tend to be discretionary goods. As these classification procedures are quite different – and conceptually, this focusses on the sensitivity of price responses rather than consumption cyclicality – the resulting series behave differently.

Chart A6

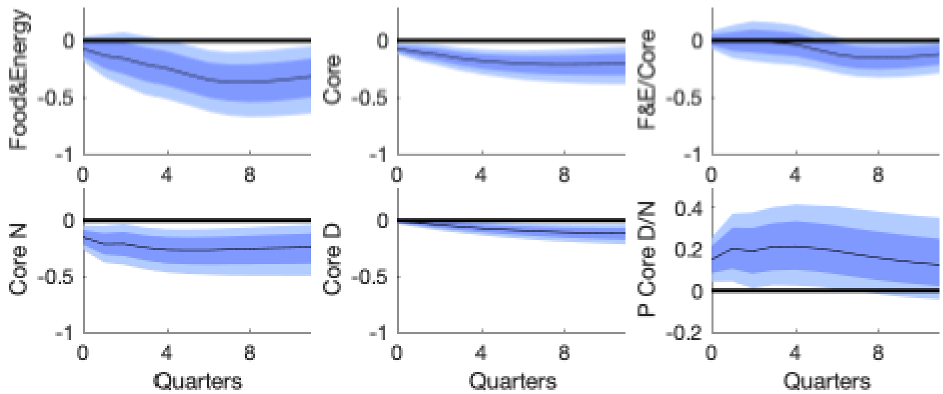
IRFs to a monetary policy shock, full sample (1999Q1–2024Q2).



Notes: IRFs in response to a one standard deviation monetary policy shock, estimated using a BVAR on a quarterly sample 1999-2024q2. Median (line), percentiles 16–84 (darker band), percentiles 5–95 (lighter band). Quarters on the horizontal axes. Each IRF corresponds to a separate BVAR estimate with the respective variable added as an additional variable to the baseline controls (monetary policy shocks, 1y yield, GDP, HICP, stock index, unemployment, corporate bond spread). See text for full specification details and Appendix for IRFs of baseline controls.

Chart A7

IRFs to a monetary policy shock, pre-Covid sample (1999Q1–2019Q4)



Notes: IRFs in response to a one standard deviation monetary policy shock, estimated using a BVAR on a quarterly sample 1999-2019q4. Median (line), percentiles 16–84 (darker band), percentiles 5–95 (lighter band). Quarters on the horizontal axes. Each IRF corresponds to a separate BVAR estimate with the respective variable added as an additional variable to the baseline controls (monetary policy shocks, 1y yield, GDP, HICP, stock index, unemployment, corporate bond spread). See text for full specification details and Appendix for IRFs of baseline controls.

Appendix E: Calculations behind the recession plots, and recession plots for price indices and stock prices.

This section provides the detailed methodology underlying Chart 4 in the main text. The black dashed line shows the change in the aggregate variable of interest relative to the start of the recession. Recession dates are taken from the Euro Area Business Cycle Network (EACBN). For the consumption series, changes are calculated as log differences; for employment and inflation, they are calculated as simple differences. For consumption, each point on the black dashed line is computed as $\log(c_{t+h}) - \log(c_t)$, where *t* is the quarter marking the start of the recession. For employment, each point is calculated as $er_{t+h} - er_t$, analogously for inflation.

The red and blue bars decompose these aggregate changes into contributions from necessity and discretionary activities. These are calculated by taking the change in each sector-specific series (relative to the start of the recession, using the same method as for the aggregate) and multiplying it by that sector's weight in the aggregate series. An exception applies to the employment rate: since the aggregate employment series is the sum of the necessity and discretionary employment series, the red and blue bars here simply represent the change in employment in each sector relative to the start of the recession.

Appendix F: Monetary Policy Shocks, IRFs of baseline proxy-VAR and IRFs obtained with alternative specifications.

F.1 IRFs of baseline proxy-VAR and IRFs obtained with alternative specifications.

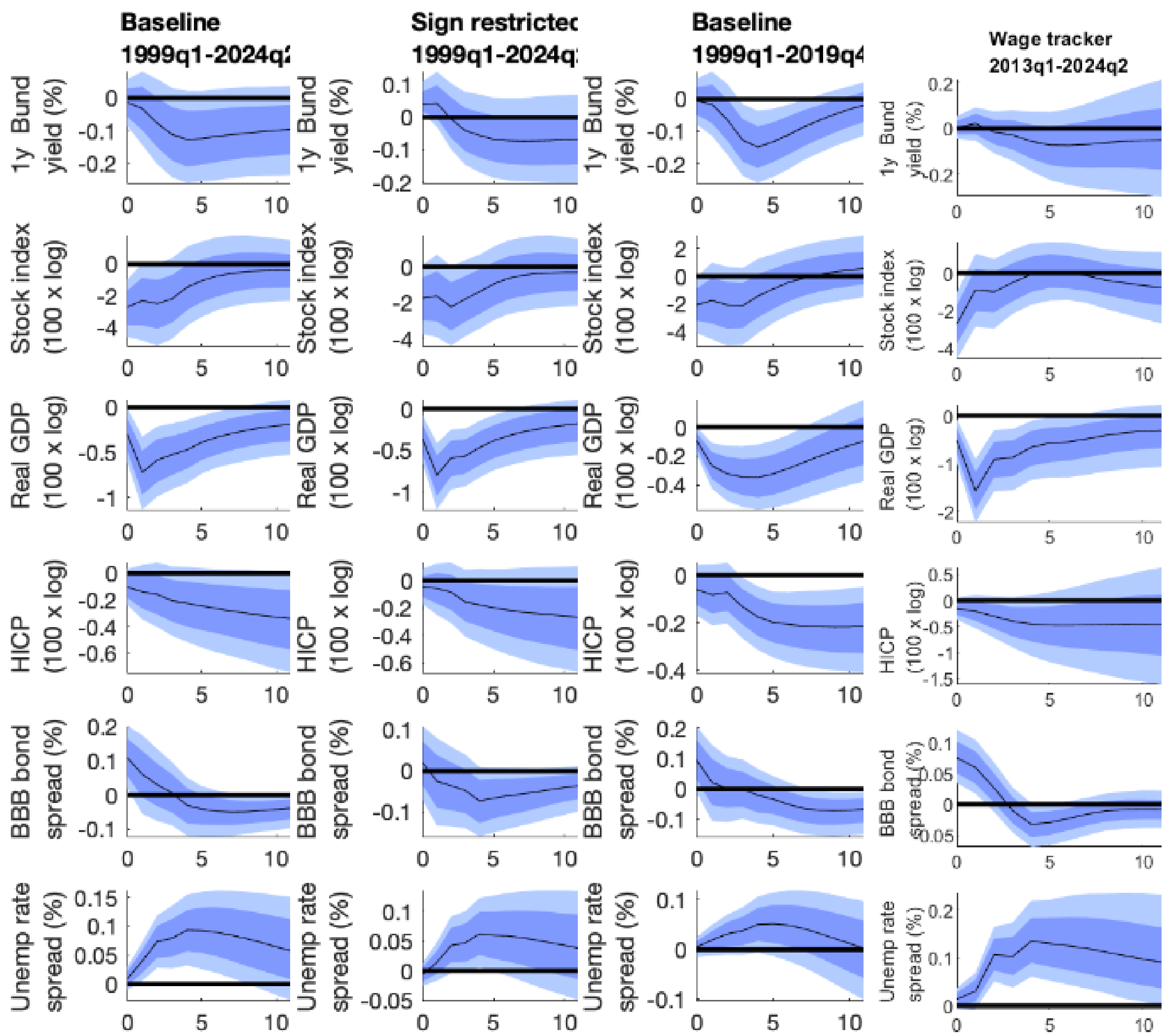
Chart A6 presents the impulse response functions (IRFs) of the control variables across all BVAR specifications we estimate. Column 1 shows the IRFs from our baseline specification, estimated on the full sample from 1999Q1 to 2024Q2, using the "poor man's" identification of monetary policy shocks, following Jarociński and Karadi (2020) (JK). Column 2 displays the IRFs from an alternative specification estimated on the same full sample, but using the sign restrictions identification approach, also based on JK. Column 3 reports the IRFs obtained using the "poor man's" identification, but with the sample restricted to the pre-COVID period, from 1999Q1 to 2019Q4. Finally, Column 4 presents the IRFs estimated using the same identification method, but on the shorter sample from 2013Q1 to 2024Q2, which corresponds to the period for which the wage tracker series is available.

The IRFs are similar to the ones obtained by JK and broadly robust across the different specifications. Following a monetary policy tightening, stock prices, real GDP, and inflation decline, while the BBB-AAA spread and the unemployment rate increase. Notably, we estimate a rise in the 1-year Bund yield only in the specification that uses sign restrictions. This result reflects the additional restriction imposed—following again JK—that the impact response of the one-year bond yield is at least one basis point. Our estimates for the response of the 1-year Bund yield under the "poor man's" identification strategy are consistent with the findings reported in their study.

Chart A6

IRFs to a monetary policy shock

Full Set of Macro Variables, Different Specifications



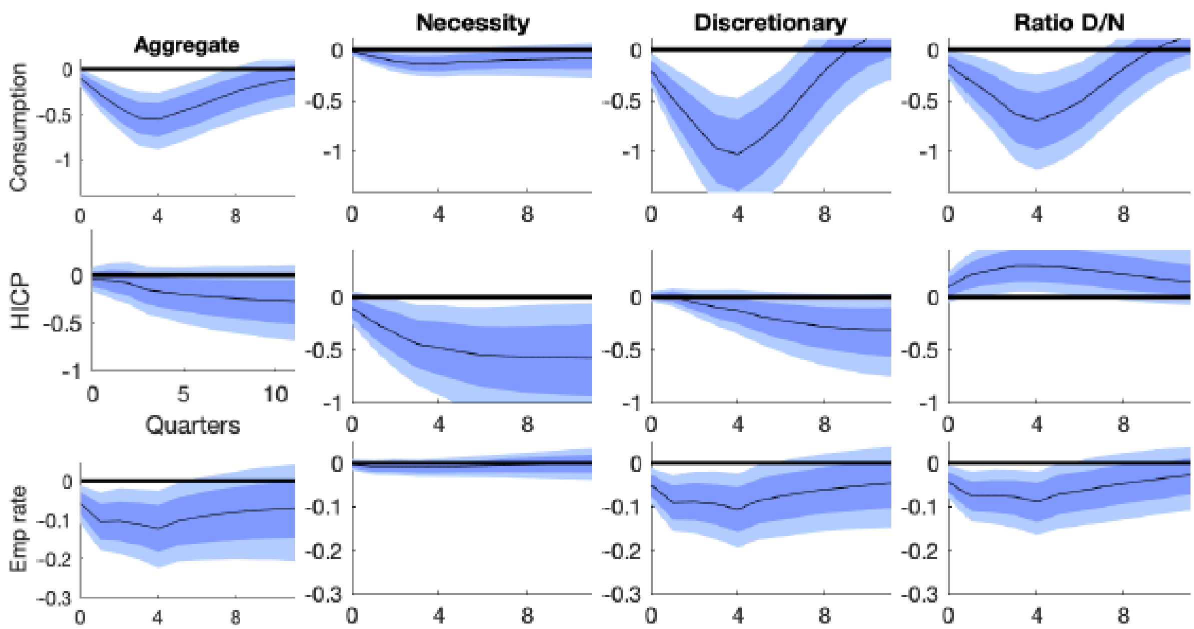
Notes: IRFs in response to a one standard deviation monetary policy shock, estimated using a BVAR on a quarterly sample 1999-2024q2. Median (line), percentiles 16–84 (darker band), percentiles 5–95 (lighter band). Quarters on the horizontal axes. Each column reports IRFs for the baseline set of control variables—monetary policy shocks, 1-year yield, GDP, HICP, stock index, unemployment, and the corporate bond spread—used across all specifications discussed in the main text. The first column shows IRFs estimated using the baseline specification with "poor man's" identification on the full sample. The second column uses sign restrictions for identification, while the third displays IRFs estimated on the pre-COVID sample.

Charts A7a, A7b and A8 report the IRFs for our primary variables of interest, derived from estimating the BVAR model using sign restrictions. These results are consistent with the findings reported in the main text, where identification is achieved via the “poor man's” approach. Charts A9a, A9b and A10 present the IRFs obtained from our baseline specification, specifically estimated on the pre-COVID sample. The patterns observed remain consistent with the results derived from the full-sample analysis.

Chart A7a

IRFs to a monetary policy shock

Consumption, Prices, Employment Rate– Sign Restrictions Identification

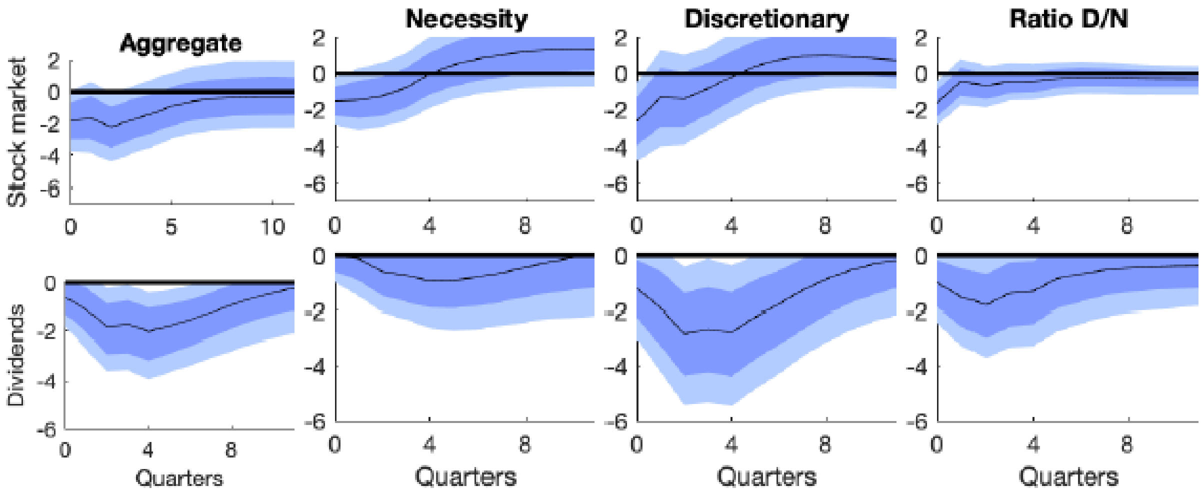


Notes: IRFs in response to a one standard deviation monetary policy shock, estimated using a BVAR on a quarterly sample 1999-2024q2. Median (line), percentiles 16–84 (darker band), percentiles 5–95 (lighter band). Quarters on the horizontal axes. These show the counterpart IRFs to the main text, using sign-restriction based identification rather than the ‘poor man’ surprise approach, see text for discussion.

Chart A7b

IRFs to a monetary policy shock

Stock Prices & Dividends– Sign Restrictions Identification

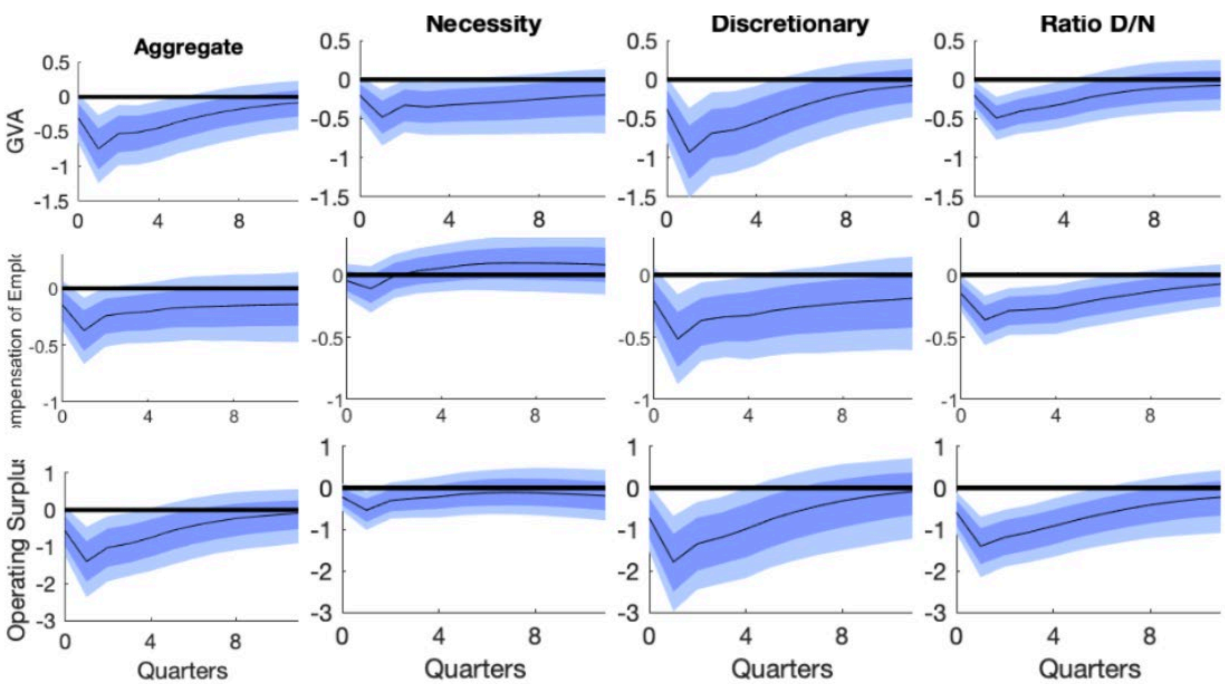


Notes: IRFs in response to a one standard deviation monetary policy shock, estimated using a BVAR on a quarterly sample 1999-2024q2. Median (line), percentiles 16–84 (darker band), percentiles 5–95 (lighter band). Quarters on the horizontal axes. These show the counterpart IRFs to the main text, using sign-restriction based identification rather than the 'poor man' surprise approach, see text for discussion.

Chart A8

IRFs to a monetary policy shock

GVA, Operating Surplus, Compensation of Employees – Sign Restrictions Identification

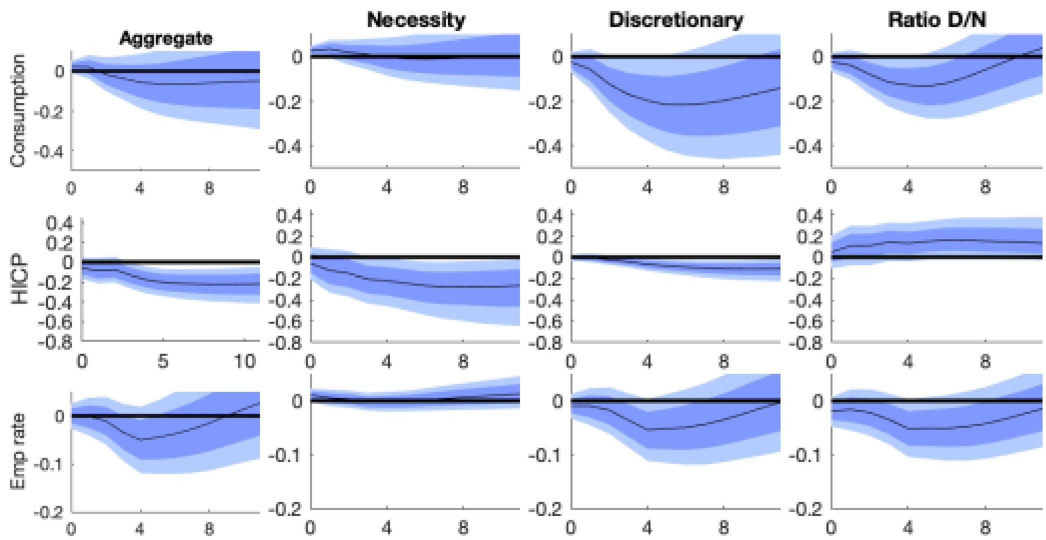


Notes: IRFs in response to a one standard deviation monetary policy shock, estimated using a BVAR on a quarterly sample 1999-2024q2. Median (line), percentiles 16–84 (darker band), percentiles 5–95 (lighter band). Quarters on the horizontal axes. These show the counterpart IRFs to the main text, using sign-restriction based identification rather than the 'poor man' surprise approach, see text for discussion.

Chart A9a

IRFs to a monetary policy shock

Consumption, Prices, Employment Rate – Pre-Covid Sample

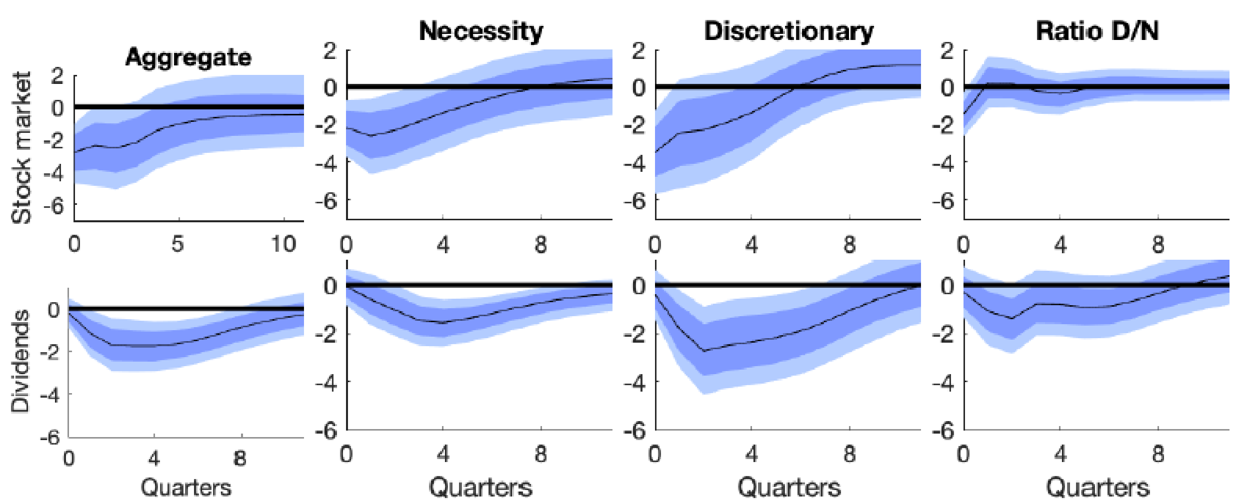


Notes: IRFs in response to a one standard deviation monetary policy shock, estimated using a BVAR on a quarterly sample 1999-2019q4. Median (line), percentiles 16–84 (darker band), percentiles 5–95 (lighter band). Quarters on the horizontal axes. These IRFs are the counterpart of the main text, restricting the sample to pre-covid.

Chart A9b

IRFs to a monetary policy shock

Stock Prices and Dividends – Pre-Covid Sample

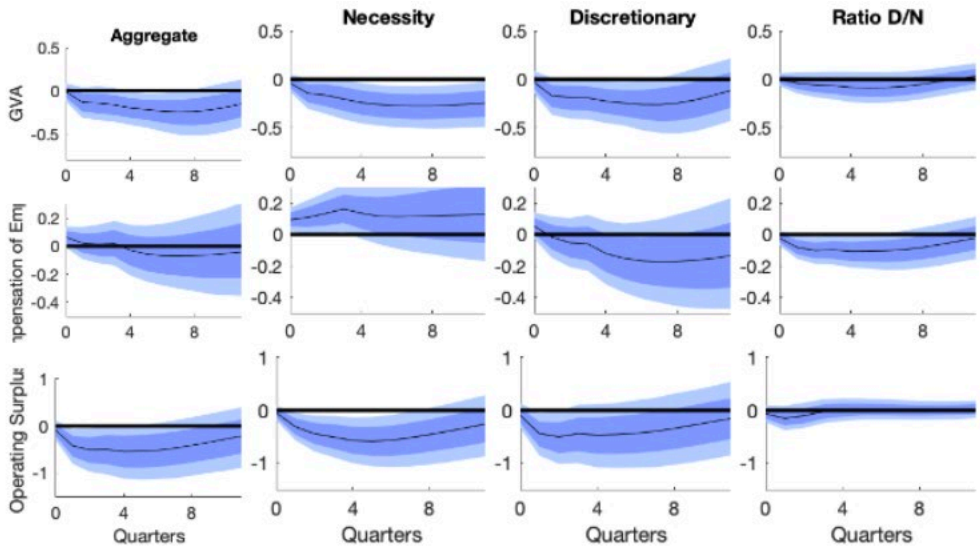


Notes: IRFs in response to a one standard deviation monetary policy shock, estimated using a BVAR on a quarterly sample 1999-2019q4. Median (line), percentiles 16–84 (darker band), percentiles 5–95 (lighter band). Quarters on the horizontal axes. These IRFs are the counterpart of the main text, restricting the sample to pre-covid.

Chart A10

IRFs to a monetary policy shock

GVA, Operating Surplus, Compensation of Employees – Sign Restrictions Identification



Notes: IRFs in response to a one standard deviation monetary policy shock, estimated using a BVAR on a quarterly sample 1999-2019q4. Median (line), percentiles 16–84 (darker band), percentiles 5–95 (lighter band). Quarters on the horizontal axes. These IRFs are the counterpart of the main text, restricting the sample to pre-covid.

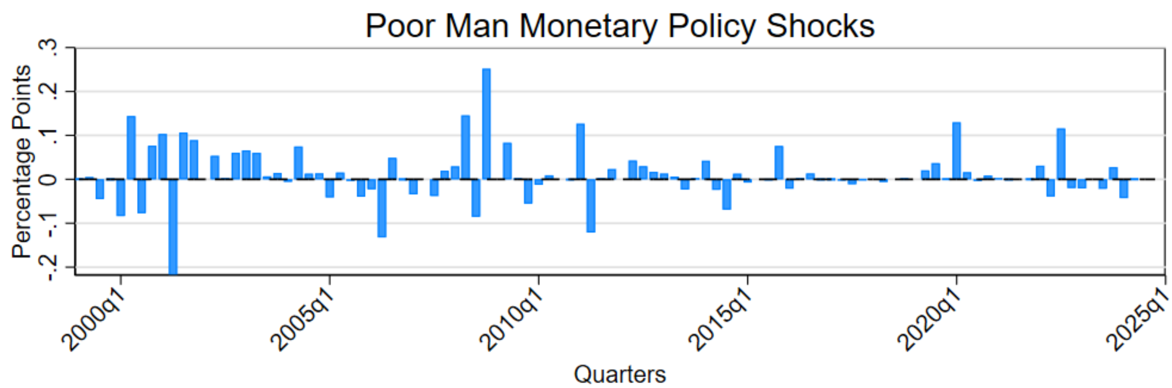
F.2 Monetary Policy Shocks

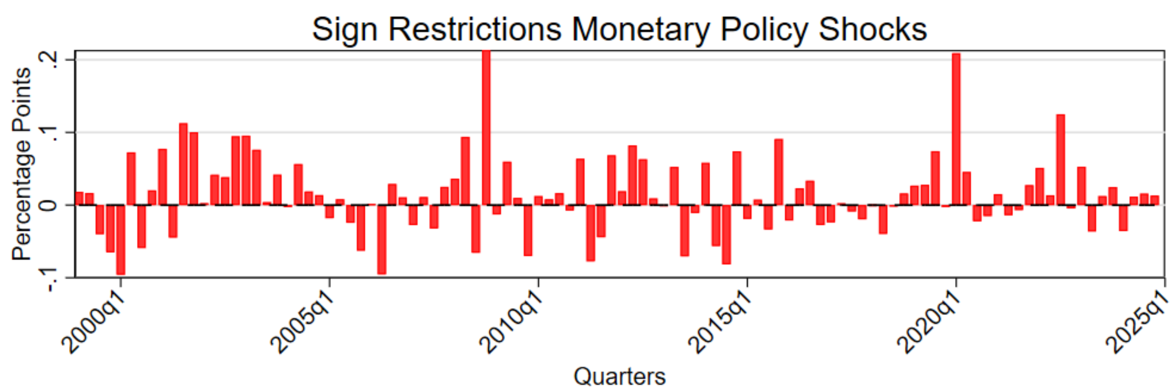
Chart AX displays the time series of the ‘poor man’ and sign restricted monetary policy shocks that we use in our baseline specification and in robustness tests. The shocks are obtained cumulating the monthly ‘poor man’ and sign restricted shocks from Jarosinski and Karadi within each quarter in our sample.

Chart A11

IRFs to a monetary policy shock

Full Set of Macro Variables, Different Specifications





Notes: 'Poor man' (in the top panel) and sign restrictions (in the bottom panel) monetary policy shocks. The shocks are obtained by cumulating the monthly 'poor man' and sign restrictions monetary policy shocks from Jarocinski and Karadi (2020) within each quarter in the sample.

Appendix G: Model derivations

This appendix explains the derivations of the theoretical model. We follow closely Andreolli, Rickard, and Surico (2024). The key difference is the presence of a symmetric cost-push shock to study optimal policy. The notation is different, in this paper, discretionaries/luxuries/non-essentials are defined with a superscript D, in Andreolli, Rickard, and Surico (2024) with N. Necessities/essentials are defined with a N in this paper, and with an E in Andreolli, Rickard, and Surico (2024).

G.1 Households

We first solve the problem of the Ricardian agent, and then the Hand-to-Mouth one. The key role of inattention is to allow for a hump shape in the response in consumption, as in the empirical IRFs, while at the same time keeping the relative IES across different goods.

Ricardian agents problem. The nominal budget constraint of the unconstrained agents is:

$$P_t^N C_{H,t}^N + P_t^D C_{H,t}^D + B_{H,t} \leq W_{H,t} N_{H,t} + \Pi_{H,t} + T_{H,t} + R_{t-1} B_{H,t-1}$$

They consume necessity and discretionary goods at prices P_t^N and P_t^D respectively, they can invest in nominal bonds $B_{H,t}$ that earn risk free nominal rate R_t, the wage they earn is $W_{H,t}$, they also receive transfers $T_{H,t}$ and profits $\Pi_{H,t}$. We can rewrite the budget constraint defining wealth in terms of the necessity price $a_{H,t}$:

$$a_{H,t} = b_{H,t-1}\frac{R_{t-1}}{\pi_t^N} + w_{H,t} N_{H,t} + \Pi_{H,t}^r + t_{H,t}$$

$$a_{H,t+m+1} = \prod_{k=0}^{m} \tilde{R}_{t+k+1} a_{H,t} - \sum_{j=0}^{m} \prod_{k=j}^{m} \tilde{R}_{t+k+1} (C_{H,t+j}^N + p_{t+j}^D C_{H,t+j}^D)$$
$$+ \sum_{j=0}^{m} \prod_{k=j+1}^{m} \tilde{R}_{t+k+1} (w_{t+j+1} N_{H,t+j+1} + \Pi_{H,t+j+1}^r + t_{H,t+j+1})$$

Where $\pi_{t+1}^N \equiv \frac{P_{t+1}^N}{P_t^N}$ is the inflation of necessity goods, and similarly for discretionary goods, $\widetilde{R_{t+1}} \equiv \frac{R_t}{\pi_{t+1}^N}$ is real ex-post rate in terms of the necessity price inflation. All lower-case variables are the corresponding uppercase variable in terms of the necessity price: $p_t^D \equiv \frac{P_t^D}{P_t^N}$, $w_{H,t} \equiv \frac{W_{H,t}}{P_t^N}$, $t_{H,t} \equiv \frac{T_{H,t}}{P_t^N}$, and $b_{H,t} \equiv \frac{B_{H,t}}{P_t^N}$. We define $\Pi_{H,t}^r \equiv \frac{\Pi_{H,t}}{P_t^N}$ as real profits to avoid confusion with inflation.

Households update their expectations only sporadically. Specifically, they update with probability λ. Somebody who updates today has probabilities $\lambda(1-\lambda)^j$ in j+1 periods. When they update, the problem is as in year zero, making the problem recursive. As they realise that they might not be able to update, households make plans for future choices in the current period. They choose consumption of a variety i for today: $C_{i,t,0}^N$ and for the future if they don't update $C_{i,t+j,j}^N$ for j periods ahead, and similarly for discretionary consumption and savings. As households delegate the labour choice to unions, we can ignore the disutility of labour in the household problem.

$$V(a_{H,t}) = \max_{\{C_{H,t+m,m}^N, C_{H,t+m,m}^D\}_{m=0}^{\infty}} \left(\sum_{m=0}^{\infty} \beta^m (1-\lambda)^m \left(\frac{(C_{H,t+m,m}^N)^{1-\frac{1}{\gamma^N}}}{1-\frac{1}{\gamma^N}} + \varphi \frac{(C_{H,t+m,m}^D)^{1-\frac{1}{\gamma^D}}}{1-\frac{1}{\gamma^D}} \right) \right.$$
$$\left. + \beta\lambda \sum_{m=0}^{\infty} \beta^m (1-\lambda)^m \mathbb{E}_t V(a_{H,t+m+1}) \right)$$
$$s.t.\ a_{H,t+m+1} = \prod_{k=0}^{m} \tilde{R}_{t+k+1} a_{H,t} - \sum_{j=0}^{m} \prod_{k=j}^{m} \tilde{R}_{t+k+1} (C_{H,t+j}^N + p_{t+j}^D C_{H,t+j}^D)$$

The household makes plans for when they cannot update (first terms) and for when they can update (second terms). By taking the same steps as Mankiw and Reis (2007) and Andreolli, Rickard, and Surico (2024) we can arrive to the equations that summarise the problems of the Ricardian agents: four equilibrium conditions, a budget constraint (which drops out due to Walras Law), two aggregation equations, and an equation summarising the average marginal utility. The equilibrium conditions consist of: an Euler equation for the attentive consumer in terms of the necessity good, an intra-temporal condition linking consumption of necessity goods to discretionary goods for an attentive consumer, and two conditions, one for necessity goods and one for discretionary goods, linking the consumption plans for consumers who do not update to the expectation of what an attentive consumer would do.

$$(C^N_{H,t,0})^{-\frac{1}{\gamma^N}} = \beta \mathbb{E}_t \left((C^N_{H,t+1,0})^{-\frac{1}{\gamma^N}} \frac{R_t}{\pi^N_{t+1}} \right) \qquad \varphi (C^D_{H,t,0})^{-\frac{1}{\gamma^D}} = p^D_t (C^N_{H,t,0})^{-\frac{1}{\gamma^N}}$$
$$(C^N_{H,t+j,j})^{-\frac{1}{\gamma^N}} = \mathbb{E}_t \left((C^N_{H,t+j,0})^{-\frac{1}{\gamma^N}} \right) \qquad (C^D_{H,t+j,j})^{-\frac{1}{\gamma^D}} = \mathbb{E}_t \left((C^D_{H,t+j,0})^{-\frac{1}{\gamma^D}} \right)$$

Consumption aggregation across attentive and non-attentive consumers, as a function of the expected actions of attentive consumers:

$$C^N_{H,t} = \lambda \sum_{j=0}^{\infty} (1-\lambda)^j \left[\mathbb{E}_{t-j} \left((C^N_{H,t,0})^{-\frac{1}{\gamma^N}} \right) \right]^{-\gamma^N}$$
$$C^D_{H,t} = \lambda \sum_{j=0}^{\infty} (1-\lambda)^j \left[\mathbb{E}_{t-j} \left((C^D_{H,t,0})^{-\frac{1}{\gamma^D}} \right) \right]^{-\gamma^D}$$

We can define the average marginal utility of consumption aggregated across attentive and inattentive agents, to use as an objective function for the union:

$$\zeta_{H,t} = (C^N_{H,t})^{-\frac{1}{\gamma^N}} \frac{C^N_{H,t}}{C^N_{H,t} + C^D_{H,t} p^D_t} + (C^D_{H,t})^{-\frac{1}{\gamma^D}} \frac{\varphi}{p^D_t} \frac{C^D_{H,t} p^D_t}{C^N_{H,t} + C^D_{H,t} p^D_t}$$

Hand-to-mouth agents' problem. Constrained agents face the same problem, with the same information friction, but do not have access to bond markets. They make plans for consumption choices in the future, as they can also be inattentive, but do not have saving choices to smooth out inconsistent plans as the Ricardian agents. Therefore, we posit a risk sharing agreement across hand-to-mouth households, to ensure that each household follows ex-post their consumption plans and the overall hand-to-mouth agents budget constraint is satisfied. First, we show the budget constraint in terms of wealth:

$$C^N_{L,t} + p^D_t C^D_{L,t} \leq a_{L,t} = w_{L,t} N_{L,t} + \Pi^r_{L,t} + t_{L,t}$$

Their maximisation problem, for the periods in which they cannot update:

$$V(a_{L,t}) = \max_{\{C^N_{L,t+m,m}, C^D_{L,t+m,m}\}_{m=0}^{\infty}} \sum_{m=0}^{\infty} \beta^m (1-\lambda)^m \left(\frac{(C^N_{L,t+m,m})^{1-\frac{1}{\gamma^N}}}{1-\frac{1}{\gamma^N}} + \varphi \frac{(C^D_{L,t+m,m})^{1-\frac{1}{\gamma^D}}}{1-\frac{1}{\gamma^D}} \right.$$
$$\left. + \eta_{t+j} \mathbb{E}_t \left(a_{L,t+m} - C^N_{L,t+m,m} - C^D_{L,t+m,m} p^D_{t+m} \right) \right)$$

To find the solution, take the FOC for the two goods and equate the marginal utilities to arrive to the three equilibrium conditions as for the Ricardian agents, minus the Euler equation:

$$\varphi(C^N_{L,t,0})^{-\frac{1}{\gamma^N}} = (C^D_{L,t,0})^{-\frac{1}{\gamma^D}} \frac{1}{p^D_t}$$

$$(C^N_{L,t+j,j})^{-\frac{1}{\gamma^D}} = \mathbb{E}_t(C^N_{L,t+j,0})^{-\frac{1}{\gamma^D}} \qquad (C^D_{L,t+j,j})^{-\frac{1}{\gamma^D}} = \mathbb{E}_t(C^D_{L,t+j,0})^{-\frac{1}{\gamma^D}}$$

We can still aggregate goods consumption across attentive and non-attentive consumers. By assuming risk sharing across consumers, agents can follow through with their plans ex-post. Moreover, we can still define the average marginal utility of consumption.

$$C^N_{L,t} = \lambda \sum_{j=0}^{\infty} (1-\lambda)^j \left[\mathbb{E}_{t-j}\left((C^N_{L,t,0})^{-\frac{1}{\gamma^N}}\right)\right]^{-\gamma^N}$$

$$C^D_{L,t} = \lambda \sum_{j=0}^{\infty} (1-\lambda)^j \left[\mathbb{E}_{t-j}\left((C^D_{L,t,0})^{-\frac{1}{\gamma^D}}\right)\right]^{-\gamma^D}$$

$$\zeta_{L,t} = (C^N_{L,t})^{-\frac{1}{\gamma^N}} \frac{C^N_{L,t}}{C^N_{L,t} + C^D_{L,t} p^D_t} + (C^D_{L,t})^{-\frac{1}{\gamma^D}} \frac{\varphi}{p^D_t} \frac{C^D_{L,t} p^D_t}{C^N_{L,t} + C^D_{L,t} p^D_t}$$

G.2 Unions

Unions operate under perfect competition and are fully responsive. There are two unions, each representing a different type of consumer: Ricardian and Hand-to-Mouth. Following Mankiw and Reis (2007), we separate consumption and labor supply decisions by introducing unions. Since each union represents the entire household, it uses the average marginal utility of consumption when determining labor supply. This framework leads to two standard intra-temporal equilibrium conditions: $\xi \frac{N^{\chi}_{L,t}}{\zeta_{H,t}} = w_{L,t}$ and $\xi \frac{N^{\chi}_{H,t}}{\zeta_{L,t}} = w_{H,t}$.

G.3 Firms

Final good producers. The final good producers combine different retail varieties of the necessity and discretionary goods according to a CES aggregator. $Y^i_t = \left(\int_0^1 (y^i_{k,t})^{\frac{\varepsilon-1}{\varepsilon}} dk\right)^{\frac{\varepsilon}{\varepsilon-1}}$ for $i = \{N, D\}$. This leads to a standard demand that the final good producers have for different varieties of a given good category: $y^i_{k,t} = Y^i_t \left(\frac{P^i_{k,t}}{P^i_t}\right)^{-\varepsilon}$

Calvo retailers. There two sets of retailers, one set for necessity goods and the second for discretionary goods. The problem is symmetric across sectors. In a given sector i, they buy a wholesale good and use it to produce the retail variety $y^i_{k,t}$. Differently from Andreolli, Rickard, and Surico (2024), the price they pay is subject to a stochastic disturbance that creates a cost-push shock: $P^{i,w}_t X_t^{1/\kappa^i}$. X_t has an AR(1) structure once log-linearised: $\ln(X_t) = \rho_X \ln(X_{t-1}) + \sigma_X \varepsilon_{X,t}$. Importantly, the same X_t hits both the necessity and the discretionary sectors. We scale X_t with $\frac{1}{\kappa^i}$, the inverse of the slope of the linearised Phillips Curve, in order to have a one percent cost-push shock having a one percent direct, partial equilibrium, effect on inflation in each sector. The real marginal cost $S_t^i X_t^{1/\kappa^i} = \frac{P_t^{i,w} X_t^{1/\kappa^i}}{P_t^N}$ is the wholesale price relative to its retail average value, scaled with the stochastic disturbance. They receive a subsidy τ^i for each unit of good they produce and pay lump sum taxes T_t^i; these taxes allow to have zero profit in steady state but do not affect the profit allocation off-steady state. The retailers face a Calvo friction to change prices, where the probability of not being able to reset prices is equal to θ in each period. We use the SDF of Ricardian households but notice that as we take a first order Taylor approximation to solve the model, the choice of whose SDF we take drops out. This leads to a standard non-linear three equations New-Keynesian Phillips Curve.

$$K_t^{i,f} = \left(C_{H,t}^i\right)^{-\frac{1}{\gamma^i}} Y_t^i \mathcal{S}_t^i X_t^{1/\kappa^i} \frac{\varepsilon^i}{\varepsilon^i - 1}(1-\tau^i) + \theta\beta\mathbb{E}_t(\pi_{t+1}^i)^{\varepsilon^i} K_{t+1}^{i,f}$$
$$F_t^{i,f} = \left(C_{H,t}^i\right)^{-\frac{1}{\gamma^i}} Y_t^i + \theta\beta\mathbb{E}_t(\pi_{t+1}^i)^{\varepsilon^i - 1} F_{t+1}^{i,f}$$
$$\frac{K_t^{i,f}}{F_t^{i,f}} = \left(\frac{1-\theta(\pi_t^i)^{\varepsilon^i - 1}}{1-\theta}\right)^{\frac{1}{1-\varepsilon^i}}$$

Wholesalers. Wholesalers produce one type of good, necessity or discretionary, are perfectly competitive and they combine high-skill labour $N_{H,t}^i$ and low-skill labour $N_{L,t}^i$ with a Cobb-Douglas production function:

$$Y_t^N = A_t^N (N_{L,t}^N)^{\alpha^N} (N_{H,t}^N)^{1-\alpha^N} \qquad Y_t^D = A_t^D (N_{L,t}^D)^{\alpha^D} (N_{H,t}^D)^{1-\alpha^D}$$

They sell these goods at nominal price $P_t^{i,w}$ to retailers. They pay nominal wage $W_{H,t}$ for each unit of high-skilled household labour and nominal $W_{L,t}$ for each unit of low-skilled household labour. The low-skilled share in production is α^i. As discussed in the main text, we have that $\alpha^N < \alpha^D$: there are relatively more low-skilled workers in discretionary goods production than in necessity goods production. The solution to the problem of the necessity and the discretionary wholesalers are:

$$\mathcal{S}_t^N \alpha^N \frac{Y_t^N}{N_{L,t}^N} = w_{L,t},\ \mathcal{S}_t^N (1-\alpha^N) \frac{Y_t^N}{N_{H,t}^N} = w_{H,t}, \quad \mathcal{S}_t^D \alpha^D \frac{Y_t^D}{N_{L,t}^D} = \frac{w_{L,t}}{p_t^D},\ \mathcal{S}_t^D (1-\alpha^D) \frac{Y_t^D}{N_{H,t}^D} = \frac{w_{H,t}}{p_t^D}$$

G.4 Market Clearing

We close the model with two goods market clearing condition, for necessity and discretionary goods, two labour market clearing conditions, for high and low skilled labour, and bond marker clearing condition by which bonds are in zero net supply. In this economy the population is divided in the two types of households with total mass equal to one: $1 = \mu_H + \mu_L$. The market clearing conditions for the two goods markets:

$$Y_t^N = C_t^N = \sum_{i=\{H,L\}} \mu_i C_{i,t}^N \qquad Y_t^D = C_t^D = \sum_{i=\{H,L\}} \mu_i C_{i,t}^D$$

The labour market clearing conditions for the two types of labour:

$$N_{H,t}^N + N_{H,t}^D = \mu_H N_{H,t} \qquad N_{L,t}^N + N_{L,t}^D = \mu_L N_{L,t}$$

The bonds market clearing specifies that bonds are in zero net supply: $\mu_H B_{H,t} = 0$. We compute real GDP with production in the two sectors weighted by prices in steady state, with P^N being normalised to one: $Y_t = Y_t^N + p^D Y_t^D$. Variables without time subscripts denote steady state values. We define CPI inflation by averaging the inflation rate in the two sectors with the steady state economy wide consumption shares:

$$\pi_t^{CPI} = \frac{C^N}{C^N + p^D C^D}\pi_t^N + \frac{p^D C^D}{C^N + p^D C^D}\pi_t^D$$

G.5 Government

The government consists of a central bank that sets interest rates according to a Taylor rule:

$$\frac{R_t}{R} = \left(\frac{R_{t-1}}{R}\right)^{\rho_R}\left(\left(\mathbb{E}_t(\pi_{t+1}^{target})\right)^{\phi_\pi}\left(\frac{Y_t}{Y}\right)^{\phi_Y}\right)^{1-\rho_R}\exp(\sigma_R \varepsilon_{R,t})$$

Where target inflation is: $\pi_t^{\text{target}} = \phi_{\pi^D}\pi_t^D + (1-\phi_{\pi^D})\pi_t^N$. As discussed in the main text, the central bank achieves the standard aggregate/CPI targeting by setting $\phi_{\pi^D} = \frac{p^D C^D}{C^N + p^D C^D}$.

The only role of fiscal policy in the baseline model is to ensure that Calvo retailers profits are zero in steady state. The government sets a lump sum tax on each Calvo retailer such that it pays in a non-distortive way for the subsidy to the same retailer. With this tax, retailers profits are zero in steady state.

$$T_t^N = \tau^N P_t^N \mathcal{S}_t^N X_t^{1/\kappa^i} Y_t^N \qquad T_t^D = \tau^D P_t^D \mathcal{S}_t^D X_t^{1/\kappa^i} Y_t^D$$

With $\tau^N = 1/\varepsilon^N$ and $\tau^D = 1/\varepsilon^D$. Taxes to households are zero and there is no government spending. Therefore, the government runs a balanced budget. We specify a profit allocation rule off steady state, where we give profits to Ricardian households in our baseline model in the spirit of Bilbiee (2008) or Debortoli and Galí (2024):

$$\Pi_{k,t} = \phi_{\Pi,k}^N \Pi_t^N + \phi_{\Pi,k}^D \Pi_t^D \quad k = \{H, L\}$$

G.5 Steady State Computation

We define a steady state variable simply without the time subscript. We solve for a zero-inflation steady state ($\pi^N = \pi^D = 1$). We set the transfers to the Calvo retailers at $\tau^N = 1/\varepsilon^N$ and $\tau^D = 1/\varepsilon^D$ to ensure no steady state markups ($S^N = S^D = 1$) and zero steady state profits. We normalise the steady state price level for the necessity good at 1 ($P^N = 1$) and solve for the steady state relative price p^D numerically. We target the steady state consumption shares of Ricardian and hand-to-mouth agents of discretionaties: $\overline{C}_H^D \equiv \frac{p^D C_H^D}{p^D C_H^D + C_H^N}$ and

$\overline{C}_L^D \equiv \frac{p^D C_L^D}{p^D C_L^D + C_L^N}$. To do so, we vary the relative preference parameter for discretionaries φ and the relative productivity of the two sectors $a^N \equiv A^N / A^D$.

G.6 Log-linear equilibrium

We solve the log-linearised model. Steps are standard, we log-linearise each variable, except for profits, which we linearise as they are zero in steady state. Log-linearised and linearised variables are hatted.

Equilibrium. The The competitive equilibrium consists of 28 endogenous allocations, 10 prices, and 2 exogenous processes:

$$\{\hat{C}_t,\ \hat{C}_t^N,\ \hat{C}_t^D,\ \hat{C}_{H,t}^N,\ \hat{C}_{H,t}^D,\ \hat{C}_{L,t}^N,\ \hat{C}_{L,t}^D,\ \hat{C}_{H,t,0}^N,\ \hat{C}_{H,t,0}^D,\ \hat{C}_{L,t,0}^N,\ \hat{C}_{L,t,0}^D,\ \hat{N}_{H,t},\ \hat{N}_{L,t},\ \hat{N}_{H,t}^N,\ \hat{N}_{H,t}^D,\ \hat{N}_{L,t}^N,\ \hat{N}_{L,t}^D,\ \hat{\zeta}_{H,t},\ \hat{\zeta}_{L,t},\ \hat{\Pi}_{L,t}^r,\ \hat{\Pi}_t^{r,N},\ \hat{\Pi}_t^{r,E},\ \hat{Y}_t,\ \hat{Y}_t^N,\ \hat{Y}_t^D,\ \hat{X}_t,\ \hat{Earn}_t^N\ \hat{Earn}_t^D,\ \hat{w}_{H,t},\ \hat{w}_{L,t},\ \hat{\pi}_t^N,\ \hat{\pi}_t^D,\ \hat{p}_t^D,\ \hat{\pi}_t^{CPI},\ \hat{\pi}_t^{target},\ \hat{R}_t,\ \hat{\mathcal{S}}_t^N,\ \hat{\mathcal{S}}_t^D,\ \varepsilon_{X,t},\ \varepsilon_{R,t}\};$$

such that households, final good producers, retailers, and wholesalers optimise, the central bank follows a Taylor rule, the treasury follows the tax rule, profits are disbursed according to the profit rule, and markets clear. The equilibrium is characterised by the following static equations:

$$
\begin{aligned}
-\frac{1}{\gamma^N}\hat{C}^N_{H,t,0} + \frac{1}{\gamma^D}\hat{C}^D_{H,t,0} &= -\hat{p}^D_t \\
-\frac{1}{\gamma^N}\hat{C}^N_{L,t,0} + \frac{1}{\gamma^D}\hat{C}^D_{L,t,0} &= -\hat{p}^D_t \\
C^N_L\hat{C}^N_{L,t} + p^D C^D_L(\hat{p}^D_t + \hat{C}^D_{L,t}) &= w_L N_L(\hat{w}_{L,t} + \hat{D}_{L,t}) + \frac{\hat{\Pi}^r_{L,t}}{\mu_L} \\
\hat{\zeta}_{H,t} &= -\frac{1}{\gamma^N}\hat{C}^N_{H,t}(1-\bar{C}^D_H) - \left(\frac{1}{\gamma^D}\hat{C}^D_{H,t} + \hat{p}^D_t\right)\bar{C}^D_H \\
\hat{\zeta}_{L,t} &= -\frac{1}{\gamma^N}\hat{C}^N_{L,t}(1-\bar{C}^D_L) - \left(\frac{1}{\gamma^D}\hat{C}^D_{L,t} + \hat{p}^D_t\right)\bar{C}^D_L \\
\chi\hat{N}_{H,t} - \hat{\zeta}_{H,t} &= \hat{w}_{H,t} \\
\chi\hat{N}_{L,t} - \hat{\zeta}_{L,t} &= \hat{w}_{L,t} \\
\hat{Y}^D_t &= \hat{A}^D_t + \alpha^D\hat{N}^D_{L,t} + (1-\alpha^D)\hat{N}^D_{H,t} \\
\hat{\mathcal{S}}^D_t + \hat{Y}^D_t - \hat{N}^D_{H,t} &= \hat{w}_{H,t} - \hat{p}^D_t \\
\hat{\mathcal{S}}^D_t + \hat{Y}^D_t - \hat{N}^D_{L,t} &= \hat{w}_{L,t} - \hat{p}^D_t \\
\hat{Y}^N_t &= \hat{A}^N_t + \alpha^N\hat{N}^N_{L,t} + (1-\alpha^N)\hat{N}^N_{H,t} \\
\hat{\mathcal{S}}^N_t + \hat{Y}^N_t - \hat{N}^N_{H,t} &= \hat{w}_{H,t} \\
\hat{\mathcal{S}}^N_t + \hat{Y}^N_t - \hat{N}^N_{L,t} &= \hat{w}_{L,t} \\
N^N_H\hat{N}^N_{H,t} + N^D_H\hat{N}^D_{H,t} &= \mu_H N_H\hat{N}_{H,t} \\
N^N_L\hat{N}^N_{L,t} + N^D_L\hat{N}^D_{L,t} &= \mu_L N_L\hat{N}_{L,t} \\
\hat{\Pi}^r_{L,t} &= \phi^N_{\Pi,L}\hat{\Pi}^{r,E}_t + \phi^D_{\Pi,L}\hat{\Pi}^{r,N}_t \\
\hat{\Pi}^{r,E}_t &= -Y^N(\hat{\mathcal{S}}^N_t + \hat{X}_t) \\
\hat{\Pi}^{r,N}_t &= -Y^D p^D(\hat{\mathcal{S}}^D_t + \hat{X}_t) \\
C^N\hat{C}^N_t &= \mu_H C^N_H\hat{C}^N_{H,t} + \mu_L C^N_L\hat{C}^N_{L,t} \\
C^D\hat{C}^D_t &= \mu_H C^D_H\hat{C}^D_{H,t} + \mu_L C^D_L\hat{C}^D_{L,t} \\
\hat{Y}^N_t &= \hat{C}^N_t \\
\hat{Y}^D_t &= \hat{C}^D_t \\
Y\hat{Y}_t &= Y^N\hat{Y}^N_t + p^D Y^D\hat{Y}^D_t \\
\hat{\pi}^{CPI}_t &= \frac{C^N}{C^N + p^D C^D}\hat{\pi}^N_t + \frac{p^D C^D}{C^N + p^D C^D}\hat{\pi}^D_t \\
\hat{\pi}^{target}_t &= (1-\phi_{\pi^D})\hat{\pi}^N_t + \phi_{\pi^D}\hat{\pi}^D_t \\
\hat{Earn}^N_t &= \frac{w_H N^N_H}{w_H N^N_H + w_L N^N_L}(\hat{w}_{H,t} + \hat{N}^N_{H,t}) + \frac{w_L N^N_L}{w_H N^N_H + w_L N^N_L}(\hat{w}_{L,t} + \hat{N}^N_{L,t}) \\
\hat{Earn}^D_t &= \frac{w_H N^D_H}{w_H N^D_H + w_L N^D_L}(\hat{w}_{H,t} + \hat{N}^D_{H,t}) + \frac{w_L N^D_L}{w_H N^D_H + w_L N^D_L}(\hat{w}_{L,t} + \hat{N}^D_{L,t})
\end{aligned}
$$

The following dynamic equations:

$$\frac{1}{\gamma^N}\mathbb{E}_t\left(\hat{C}^N_{H,t+1,0}\right) = \frac{1}{\gamma^N}\hat{C}^N_{H,t,0} - \mathbb{E}_t(\hat{\pi}^N_{t+1}) + \hat{R}_t$$

$$\hat{C}^N_{H,t} = \lambda\sum_{j=0}^{\infty}(1-\lambda)^j\mathbb{E}_{t-j}\left(\hat{C}^N_{H,t,0}\right)$$

$$\hat{C}^D_{H,t} = \lambda\sum_{j=0}^{\infty}(1-\lambda)^j\mathbb{E}_{t-j}\left(\hat{C}^D_{H,t,0}\right)$$

$$\hat{C}^N_{L,t} = \lambda\sum_{j=0}^{\infty}(1-\lambda)^j\mathbb{E}_{t-j}\left(\hat{C}^N_{L,t,0}\right)$$

$$\hat{C}^D_{L,t} = \lambda\sum_{j=0}^{\infty}(1-\lambda)^j\mathbb{E}_{t-j}\left(\hat{C}^D_{L,t,0}\right)$$

$$\hat{\pi}^D_t = \beta\mathbb{E}_t(\hat{\pi}^D_{t+1}) + \kappa^D\hat{\mathcal{S}}^D_t + \hat{X}_t$$

$$\hat{\pi}^N_t = \beta\mathbb{E}_t(\hat{\pi}^N_{t+1}) + \kappa^N\hat{\mathcal{S}}^N_t + \hat{X}_t$$

$$\pi^D_t = \pi^N_t + p^D_t - p^D_{t-1}$$

$$\hat{R}_t = \rho_R\hat{R}_{t-1} + (1-\rho_R)\left(\phi_\pi\left(\mathbb{E}_t(\hat{\pi}^{target}_{t+1})\right) + \phi_Y\hat{Y}_t\right) + \sigma^{mp}\varepsilon^{mp}_t$$

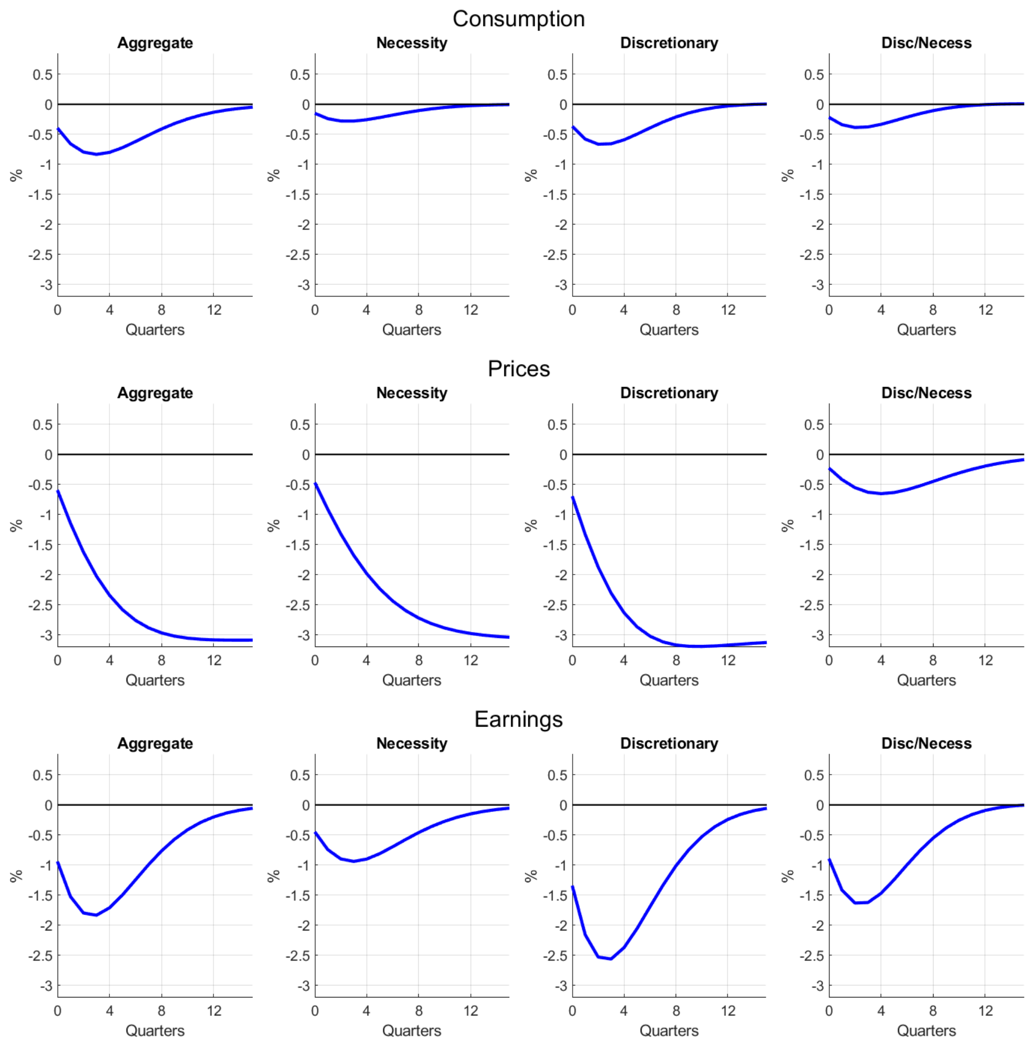
$$\hat{X}_t = \rho_X\hat{X}_{t-1} + \sigma_X\varepsilon_{X,t}$$

G.7 Impulse Response Functons

In addition to the cost-push shock, the second main departure from that model is the use of Euro-area price stickiness microdata (from Table 1) to determine the price stickiness in the model. This results in a revised calibration of $\theta = 0.75$, as discussed in the main text. This alters quantitatively the model responses to a monetary policy shock from Andreolli, Rickard, and Surico (2024); see IRFs of the key variables in Chart A12. However, the key qualitative results remain the same.

Chart A12
Discretionary cyclicality in model

Model responses to 100bp monetary policy shock



Sources: Authors' calculations

Notes: IRFs to a 100bp monetary policy shock in the full model, described in the text. Aggregate, necessity and discretionary consumption shown in first three columns; the final column shows the response of the ratio of discretionary vs necessities.

Appendix H: Optimal Monetary Policy Details

This section outlines the derivations of optimal policy and welfare comparisons, and additional results on optimal policy exercises described in Section 6.

H.1 Analytical derivation

This section outlines how we derive the welfare loss function shown in Section 6.2. We are going to do a second order Taylor expansion on the welfare function following Galí (2015). We focus on the case of a symmetric cost-push shock and no monetary policy shock. We have two complications compared to the literature: sector heterogeneity with different wages by household, so that we cannot use a unique economy-wide wage to simplify derivations, and non-homotheticity. We follow the optimal taxation literature, similarly to McKay and Wolf (2022) in assuming that the steady state level of income inequality is efficient, equivalently, we assume that the central bank mandate is about cyclical fluctuations and that steady state heterogeneity is the domain of fiscal policy. We achieve this by imposing a specific Pareto weight in the Welfare function.

Price dispersion. First, we follow the same steps as Galí (2015) and Woodford (2003) to rewrite the supply side of the economy to have highlight the variance of prices. For sector $i = \{N, D\}$:

$$\int_0^1 y_{k,t}^i dk = \int_0^1 \left(\frac{P_{k,t}^i}{P_t^i}\right)^{-\varepsilon^i} Y_t^i dk = Y_t^i \nu_t^{Pi} = C_t^i \nu_t^{Pi} = A_t^i (N_{L,t}^i)^{\alpha^i} (N_{H,t}^i)^{1-\alpha^i}$$

We focus on the price dispersion variable ν_t^{Pi}. We follow the same steps of Woodford (2003), define $\widehat{p_{k,t}^i} \equiv \log(P_{k,t}^i) - \log(P_t^i)$, take a second order Taylor approximation of $\left(P_{k,t}^i / P_t^i\right)^{-\varepsilon^i}$ to arrive at the following approximation:

$$\nu_t^{Pi} \equiv \int_0^1 \left(\frac{P_{k,t}^i}{P_t^i}\right)^{-\varepsilon^i} dk \approx 1 + \frac{\varepsilon^i}{2} Var_k(\log(P_{k,t}^i)) = 1 + \frac{\varepsilon^i}{2}\Delta_t^i$$

Where the expectation (and variance) operators are taken with respect to product varieties k: $E_k\left(\widehat{p_{k,t}^i}\right) \equiv \int_0^1 \widehat{p_{k,t}^i} dk$. With same steps as Woodford (2003), we first arrive to a dynamic mapping from price dispersion to inflation:

$$\Delta_t^i \approx \theta^i \Delta_{t-1}^i + \frac{\theta^i}{(1-\theta^i)}[\pi_t^i]^2$$

Let's iterate this expression from time -1 and take the infinite discounted sum we can arrive to a formula that depends only on the initial price dispersion and inflation in a given sector squared:

$$\Delta_t^i = (\theta^i)^{t+1}\Delta_{-1}^i + \frac{\theta^i}{(1-\theta^i)} \sum_{s=0}^{t} (\theta^i)^{t-s} [\pi_s^i]^2$$
$$\sum_{t=0}^{\infty} \beta^t \Delta_t^i = \frac{\theta^i}{1-\theta^i\beta}\Delta_{-1}^i + \frac{\theta^i}{(1-\theta^i)(1-\theta^i\beta)} \sum_{t=0}^{\infty} \beta^t [\pi_t^i]^2$$

This will go into the welfare function thought the supply side of the economy: $\widehat{Y_t^i} = \widehat{A_t^i} + \alpha^i\left(\widehat{N_{L,t}^i}\right) + \left(1-\alpha^i\right)\left(\widehat{N_{H,t}^i}\right) - \frac{\varepsilon^i}{2}\Delta_t^i$

Loss function. We next derive the loss function. Welfare is defined given some Pareto weights: λ_H and λ_L:

$$\sum_{t=0}^{\infty} \beta^t \mathcal{W}_t = \sum_{t=0}^{\infty} \beta^t (\lambda_H \mathcal{U}_{H,t} + \lambda_L \mathcal{U}_{L,t})$$

We take a second order Taylor approximation and use the steady state relationship between the marginal utility of necessity consumption and the marginal utility of discretionary consumption and of leisure:

$$\mathcal{W}_t - \mathcal{W} \approx \lambda_H U_{C_H^N} \Bigg[C_H^N \left(\hat{C}_{H,t}^N + \frac{1}{2}\left(1 - \frac{1}{\gamma^N}\right)(\hat{C}_{H,t}^N)^2 \right) + p^D C_H^D \left(\hat{C}_{H,t}^D + \frac{1}{2}\left(1 - \frac{1}{\gamma^D}\right)(\hat{C}_{H,t}^D)^2 \right) + \\ - w_H N_H \left(\hat{N}_{H,t} + \frac{1}{2}(1+\chi)(\hat{N}_{H,t})^2 \right) \Bigg] \\ + \lambda_L U_{C_L^N} \Bigg[C_L^N \left(\hat{C}_{L,t}^N + \frac{1}{2}\left(1 - \frac{1}{\gamma^N}\right)(\hat{C}_{L,t}^N)^2 \right) + p^D C_L^D \left(\hat{C}_{L,t}^D + \frac{1}{2}\left(1 - \frac{1}{\gamma^D}\right)(\hat{C}_{L,t}^D)^2 \right) + \\ - w_L N_L \left(\hat{N}_{L,t} + \frac{1}{2}(1+\chi)(\hat{N}_{L,t})^2 \right) \Bigg]$$

Here we use the assumption that the steady state is efficient, to drop the first order terms. We need two assumptions, first we assume that the Pareto weights are such that their multiplication with the marginal utility on necessity goods equals the population shares. In addition, we also assume that profits are zero in steady state thanks the optimal subsidy, similarly to representative agent New Keynesian models.

$$\mathcal{W}_t - \mathcal{W} \approx \mu_H \Bigg[C_H^N \left(\hat{C}_{H,t}^N + \frac{1}{2}\left(1 - \frac{1}{\gamma^N}\right)(\hat{C}_{H,t}^N)^2 \right) + p^D C_H^D \left(\hat{C}_{H,t}^D + \frac{1}{2}\left(1 - \frac{1}{\gamma^D}\right)(\hat{C}_{H,t}^D)^2 \right) + \\ - w_H N_H \left(\hat{N}_{H,t} + \frac{1}{2}(1+\chi)(\hat{N}_{H,t})^2 \right) \Bigg] \\ + \mu_L \Bigg[C_L^N \left(\hat{C}_{L,t}^N + \frac{1}{2}\left(1 - \frac{1}{\gamma^N}\right)(\hat{C}_{L,t}^N)^2 \right) + p^D C_L^D \left(\hat{C}_{L,t}^D + \frac{1}{2}\left(1 - \frac{1}{\gamma^D}\right)(\hat{C}_{L,t}^D)^2 \right) + \\ - w_L N_L \left(\hat{N}_{L,t} + \frac{1}{2}(1+\chi)(\hat{N}_{L,t})^2 \right) \Bigg]$$

Next, we use a second order approximation of goods and labours market clearing conditions and the production function approximation with price dispersion we just derived and drop term of higher order than squared and terms independent of policy (e.g. stochastic technology).

$$-2\frac{\mathcal{W}_t - \mathcal{W}}{C} \approx (1-\bar{C}^D)\varepsilon^N \Delta_t^N + \bar{C}^D \varepsilon^D \Delta_t^D - (1-\bar{C}^D)(\hat{C}_t^N)^2 - \bar{C}^D(\hat{C}_t^D)^2 \\ + \tilde{C}_H^N(1-\bar{C}^D)\frac{1}{\gamma^N}(\hat{C}_{H,t}^N)^2 + \tilde{C}_H^D \bar{C}^D \frac{1}{\gamma^D}(\hat{C}_{H,t}^D)^2 + (1-\alpha^{avg})\chi(\hat{N}_{H,t})^2 + \\ + (1-\tilde{C}_H^N)(1-\bar{C}^D)\frac{1}{\gamma^N}(\hat{C}_{L,t}^N)^2 + (1-\tilde{C}_H^D)\bar{C}^D \frac{1}{\gamma^D}(\hat{C}_{L,t}^D)^2 + \alpha^{avg}\chi(\hat{N}_{L,t})^2 \\ + (1-\bar{C}^D)\left((1-\alpha^N)(\hat{N}_{H,t}^N)^2 + \alpha^N(\hat{N}_{L,t}^N)^2\right) + \bar{C}^D\left((1-\alpha^D)(\hat{N}_{H,t}^D)^2 + \alpha^D(\hat{N}_{L,t}^D)^2\right) + t.i.p.$$

Where: $\overline{C}^D \equiv \frac{p^D C^D}{C} = \frac{p^D C^D}{p^D C^D + C^N}$ is the economy wide share of discretionaries, $\overline{C}_H^D \equiv \frac{p^D C_H^D}{C_H} = \frac{p^D C_H^D}{p^D C_H^D + C_H^N}$ is the share of discretionaries in Ricardian consumption, $\widetilde{C}_H^D \equiv \frac{\mu_H C_H^D}{C^D} = \frac{\mu_H C_H^D}{\mu_H C_H^D + \mu_L C_L^D}$, is the share that Ricardian have in the consumption of discretionaries over the total consumption of discretionaries, and $\alpha^{avg} = \frac{\mu_L w_L N_L}{C}$ is the economic size of the Hand-to-Mouth in terms of what fraction of total earning they have. We take an infinite sum:

$$
\begin{aligned}
-2\sum_{t=0}^{\infty}\beta^t\frac{\mathcal{W}_t-\mathcal{W}}{C} \approx \sum_{t=0}^{\infty}\beta^t\Bigg[&(1-\bar{C}^D)\varepsilon^N\frac{\theta^N}{(1-\theta^N)(1-\theta^N\beta)}[\hat{\pi}_t^N]^2+\bar{C}^D\varepsilon^D\frac{\theta^D}{(1-\theta^D)(1-\theta^D\beta)}[\hat{\pi}_t^D]^2\\
&-(1-\bar{C}^D)(\hat{C}_t^N)^2-\bar{C}^D(\hat{C}_t^D)^2\\
&+\tilde{C}_H^N(1-\bar{C}^D)\frac{1}{\gamma^N}(\hat{C}_{H,t}^N)^2+\tilde{C}_H^D\bar{C}^D\frac{1}{\gamma^D}(\hat{C}_{H,t}^D)^2+(1-\alpha^{avg})\chi(\hat{N}_{H,t})^2+\\
&+(1-\tilde{C}_H^N)(1-\bar{C}^D)\frac{1}{\gamma^N}(\hat{C}_{L,t}^N)^2+(1-\tilde{C}_H^D)\bar{C}^D\frac{1}{\gamma^D}(\hat{C}_{L,t}^D)^2+\alpha^{avg}\chi(\hat{N}_{L,t})^2\\
&+(1-\bar{C}^D)\left((1-\alpha^N)(\hat{N}_{H,t}^N)^2+\alpha^N(\hat{N}_{L,t}^N)^2\right)+\bar{C}^D\left((1-\alpha^D)(\hat{N}_{H,t}^D)^2+\alpha^D(\hat{N}_{L,t}^D)^2\right)\Bigg]+t.i.p.
\end{aligned}
$$

This is the loss function that we evaluate in the computational exercises by computing theoretical moments. We can see that in the loss function:

- The inflation rates squared in both sectors only depends on the steady state consumption shares of the two goods, on the elasticity of substitution across varieties, and on price stickiness. These do not depend on non-homotheticity or the share of Hand-to-Mouth. This means that the weights on inflation in the loss function do not vary when we simplify the models in Chart 8, exept for the economy wide share of discretionaries.
- The following consumption and labour supply terms depend on parameters and steady state values in an intuitive way. It is more costly, ceteris paribus, to face variations in necessities given that the consumption specific terms are multiplied by the inverse of the gamma parameters. The parameter that multiplies these terms do not depend on the New Keynesian Phillips Curve terms, but are affected by non-homotheticity or the share of Hand-to-Mouth.

To gather more intuition and to be comparable with the existing literature, we express the consumption and labour supply variables as functions of the output gap $\widehat{Y_t}$ and the relative price $\widehat{p_t^D}$. This mapping is exact in a model without inattention, and it can be found by solving the static equations of the model for $\widehat{Y_t}$ and $\widehat{p_t^D}$. This shows that the only thing that matter for these convolutions is the private sector structure of the economy and not policy choices or the dynamic equations. In the model with inattention this mapping is not exact, so we simulate the model for 10000 periods and then run regression of simulated $\widehat{Y_t}$ and $\widehat{p_t^D}$ as RHS variables and the consumption and labor supply choices as LHS variables. The R squared for each of these regressions is almost close to one, with the lowest one being 0.9975, indicating that this approximation error is very small. E.g. we express $\widehat{C_H^D} = a_C^{C_H^D}\widehat{C}_t + a_p^{C_H^D}\widehat{p_t^D}$. This allows us to rewrite the loss function in the standard way:

$$
-2\sum_{t=0}^{\infty}\beta^t\frac{\mathcal{W}_t-\mathcal{W}}{C} \approx \sum_{t=0}^{\infty}\beta^t\left[a_{(\pi^N)^2}[\hat{\pi}_t^N]^2+a_{(\pi^D)^2}[\hat{\pi}_t^D]^2+a_{(C)^2}\hat{C}_t^2+a_{(p^D)^2}(\hat{p}_t^D)^2+a_{(C,p^D)}(\hat{p}_t^D\hat{C}_t)\right]+t.i.p.
$$

Finally, when we progressively make our model simpler, in section 7.1, we do this by taking the following steps. When we remove non-homotheticity, we set $\gamma^N = \gamma^D = IES$, equal to average IES in the economy. When we remove sectoral heterogeneity, we set $\alpha^N = \alpha^D = \alpha^{avg}$, so that the Hand-to-Mouth keep the same economic size as in the main model, but achieve this by working equally in both sectors. When we remove Hand-to-Mouth overall, we do this by setting $\alpha^N = \alpha^D = 0$ and $\mu_L = 0$, so that they are not present in the model.

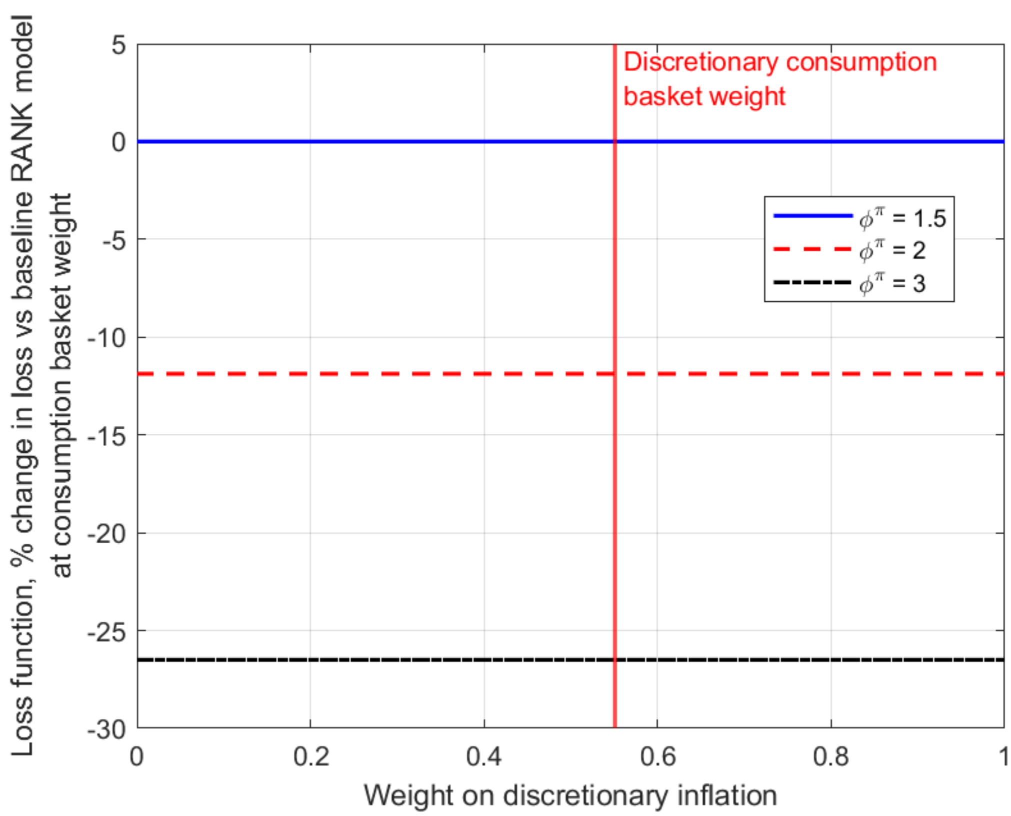
H.2 Additional results

To complement the findings of Chart 9 of the main text, Chart A13 shows the welfare loss comparison over different Taylor rule coefficients of the simplified, representative agent version of the model. In this version of the model, the three key features of the model are switched off; non-homothetic preferences are removed by setting the IES of both consumption types equal to the average IES, and we remove the presence of Hand-to-Mouth agents, a representative agent supplies all the labour to all sectors. Chart A13 replicates a common result in the optimal monetary policy literature (see, e.g. Gali 2015) that it is welfare improving for a central bank to more aggressively target inflation. Relative to the baseline $\phi_\pi = 1.5$, increasing the degree of inflation targeting to $\phi_\pi = 2$ and $\phi_\pi = 3$ decreases the welfare loss. This contrasts to our full model, where more aggressive inflation targeting is no longer welfare improving, because it comes at the cost of greater output gap variability, which is more costly in welfare terms in our model (see discussion in Section 6.3).

Inflation targeting parameter robustness

Chart A13
Impact of targeting inflation more aggressively in representative agent model

Welfare loss under different inflation Taylor rule coefficients



Sources: Authors' calculations
Notes: Change (in %) of the welfare loss across different necessity inflation weights (across the x axis) and for different parameters on inflation in the Taylor rule. All changes are relative to the baseline inflation weight of 1.5 at the necessity consumption basket weight (red vertical line). Here, the corresponding weight on the output gap is set to zero for expositional clarity, and this shows the results of the representative agent model (in contrast to those in the full model, shown in Chart 9 in the main text).