# Discretionary Inflation and Optimal Monetary Policy

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**Abstract**

What inflation should monetary policy respond to? This paper shows that when non-homothetic demand interacts with sectoral labor-market heterogeneity, the composition of inflation becomes central for policy design. We construct time series for the necessity and discretionary components of consumption, inflation, and employment in the Euro-area and document that, following a contractionary monetary shock, consumption and employment fall disproportionately in discretionary sectors, while prices respond more in necessity sectors. Discretionary industries also employ a substantially larger share of hand-to-mouth workers. We develop a tractable New Keynesian model consistent with these facts. The optimal policy assigns a higher stabilization weight to discretionary inflation than to necessity inflation, even under symmetric shocks and symmetric nominal rigidities. The mechanism is that discretionary demand is the main intertemporal adjustment margin, while discretionary employment is the main amplification margin through hand-to-mouth workers. As a result, tilting the policy response toward discretionary inflation improves stabilization of the output gap and headline inflation.

**Keywords:** income elasticity, intertemporal substitution, cyclical labour composition.
**JEL Classification Codes:** E52, D31, E21.

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# 1 Introduction

A central question in monetary economics is whether optimal policy should react only to headline inflation. This paper shows that the answer can be no. In the standard New Keynesian benchmark, once sectoral prices are aggregated with the appropriate expenditure weights, optimal monetary policy should focus on headline inflation, with departures from that prescription usually tied to familiar asymmetries such as heterogeneous nominal rigidities or sector-specific shocks, as in Aoki (2001), Woodford (2003a), Benigno (2004). This paper identifies a different and novel reason why headline-inflation targeting can be suboptimal. When demand is non-homothetic and labor-market exposure differs systematically across sectors, the central bank can improve outcomes by moving the interest rate more in response to discretionary inflation than to necessity inflation. This is a sharp departure from the classical New Keynesian prescription: even under symmetric cost-push shocks and symmetric sectoral price rigidities, optimal monetary policy assigns *unequal* stabilization weights to sectoral inflation rates.

The mechanism is simple.[1] Discretionary spending is easier to postpone intertemporally than necessity spending, in the spirit of Browning and Crossley (2000), so interest-rate movements compress discretionary demand disproportionately. At the same time, discretionary sectors employ a much larger share of hand-to-mouth workers, especially among lower-income households. Monetary tightening therefore does more than reduce consumption expenditure on the most interest-sensitive goods and services. It also lowers employment and labor income precisely where current income matters most for current consumption. This creates a feedback loop from discretionary demand to discretionary employment and, in turn, to aggregate spending. Because that amplification operates disproportionately through discretionary sectors, responding to discretionary inflation stabilizes the part of the economy where monetary policy has its largest real effects. In this environment, the composition of inflation becomes normatively salient: reacting symmetrically to necessity and discretionary inflation is no longer optimal.

This is not a study about assigning the central bank an independent redistributive mandate. In our framework, the monetary authority cares about aggregate stabilization, not inequality per se. Yet, redistribution affects transmission. By dampening downturns in discretionary sectors, monetary policy limits the income losses of households with high marginal propensities to consume, and this improves the stabilization of headline inflation and the ag-

[1] Throughout the paper, necessities refer to goods and services tied to basic needs (e.g. groceries, utilities, rent, health, and education) whereas discretionary items are expenditures that households can more easily postpone (e.g. restaurants, recreation, holidays, and many consumer durables). Formal definitions follow.

gregate output gap. In that sense, heterogeneity matters not because the objective function is redefined, but because the propagation of shocks is different. This is exactly why our main result survives even when policy is evaluated using an ad-hoc quadratic loss function defined only over CPI inflation and the output gap. More broadly, our paper complements work such as McKay and Wolf (2022) by showing that while household heterogeneity by itself need not overturn the standard case for headline-inflation targeting under conventional objectives, the interaction of household heterogeneity with sectoral demand and labor-market composition can do so.

A first implication is that the welfare tradeoff itself changes materially relative to the representative-agent New Keynesian benchmark summarized in Woodford (2003a), Galí (2015). In the textbook model, the welfare weight on the output gap is small relative to the weight on inflation stabilization, which is why inflation targeting dominates normative analysis. In our full model, by contrast, the output gap becomes much more costly. The relative weight on output-gap stabilization rises from 0.06 in the representative-agent benchmark to 0.41 in the full model, nearly a seven-fold increase. Household heterogeneity alone is not enough to deliver this result. Rather, it is the interaction between non-homothetic demand and sectoral labor-market composition that makes recessions especially costly: downturns are concentrated in the sectors where demand is most cyclical and where labor-income losses are most strongly transmitted into aggregate consumption. This provides a microfoundation for assigning much more weight to real activity than in the standard representative-agent benchmark.

A second implication concerns the design of the policy rule itself. We study simple interest rate rules in which the central bank varies the weight placed on discretionary versus necessity inflation. Headline inflation targeting corresponds to weighting sectoral inflation by expenditure shares. In the full model, welfare improves monotonically as the central bank places more weight on discretionary inflation, and the optimum is attained when it responds only to discretionary inflation. This is our main normative result. It is conceptually distinct from the classic sectoral-inflation logic of Aoki (2001), Benigno (2004), since our benchmark exercise shuts down the usual mechanism by imposing symmetric cost-push shocks and symmetric nominal rigidities across sectors. It is also different from the logic in Guerrieri et al. (2021), where sectoral asymmetries arise from reallocation frictions. In our setting, labor is mobile across sectors within skill groups. The departure from headline-inflation targeting comes instead from the interaction of non-homothetic demand and sectoral labor-market heterogeneity.

As for intuition, in the textbook New Keynesian model, inflation targeting is attractive largely because stabilizing inflation also stabilizes the welfare-relevant output gap. In our economy, the same logic points toward a different target. Discretionary expenditure is the key intertemporal adjustment margin, while discretionary employment is the key amplification margin because hand-to-mouth workers are disproportionately employed there. Discretionary inflation therefore becomes the sectoral price index most tightly connected to the welfare-relevant output gap. Leaning more strongly against discretionary inflation improves stabilization not only of that sector, but also of aggregate activity and ultimately of headline inflation. In this sense, our analysis offers a new rationale for targeting a subset of prices, which is very different from the standard core-inflation argument. The issue is not which prices are stickier. It is which prices are attached to the most consequential propagation mechanism.

Our study develops the optimal monetary policy argument in a theoretical model designed to reproduce the new evidence we uncover for the Euro-area. We construct a decomposition of consumption, inflation, employment, wages, profits, stock returns, and dividends into necessity and discretionary components. To the best of our knowledge, this decomposition has not previously been assembled for the Euro-area, and allows us to study the transmission of European Central Bank (ECB) policy through the composition of demand, prices, and employment. The data reveal a stark asymmetry. Following a contractionary monetary policy shock identified using the high-frequency approach of Altavilla et al. (2019) and Jarociński and Karadi (2020), consumption, employment, profits, stock returns, and dividend payments fall much more in discretionary sectors, while prices respond more in necessity sectors; wages show little sectoral asymmetry. Discretionary sectors also employ a larger share of hand-to-mouth workers. These facts motivate the theory and give content to its optimal-policy implications.

This Euro-area focus is deliberate. Altavilla et al. (2024) call for a research program on monetary policy for Europe that treats the Euro-area itself as the relevant object of analysis and uses heterogeneity to understand aggregate transmission and policy design, rather than treating heterogeneity as an end in itself. Our paper responds directly to that call. We use sectoral heterogeneity not simply to document unequal effects of ECB policy, but to understand how Euro-area aggregate inflation and activity are jointly determined, and how that changes the design of optimal policy. In that sense, the paper is not just about heterogeneity in Europe; it is about what heterogeneity implies for Euro-area monetary stabilization.

That framing also helps clarify how this paper differs from the companion U.S. work, Andreolli et al. (2024). The earlier paper documents similar heterogeneity across necessity and discretionary sectors in the United States and studies business-cycle amplification and fiscal stabilization. This paper does something different. It constructs a new Euro-area measurement framework, uses it to document a new set of ECB transmission facts, and then uses those facts to discipline a theory in which the composition of inflation becomes normatively relevant for monetary policy. Put differently, the earlier paper is mainly about business-cycle heterogeneity and fiscal design; this paper is mainly about how such heterogeneity overturns a classical prescription in the optimal monetary policy literature.

**Related Literature.** Our paper relates to an influential body of research on optimal monetary policy with household heterogeneity, including Acharya et al. (2023), McKay and Wolf (2022), Bilbiie (2025). The paper closest to our analysis is Olivi et al. (2025), which shows that non-homothetic consumption baskets change the optimal monetary policy tradeoff in the face of adverse *sectoral* supply disturbances. We complement this insight by showing that the interaction between non-homothetic demand and sectoral labor-market heterogeneity is independent determinant of optimal policy, even under *symmetric* supply shocks. In our setting, this interaction makes sectoral demand and employment composition central for aggregate stabilization, making the composition of inflation directly relevant for welfare-based monetary policy.

Our findings also contribute to the literature on sectoral inflation targeting, including Aoki (2001), Woodford (2003a), Benigno (2004), Guerrieri et al. (2021). The distinctive contribution here is to identify a new departure from headline-inflation targeting that does not rely on asymmetric shocks, different nominal rigidities, or the reallocation mechanism emphasized by Guerrieri et al. (2021). Instead, the deviation comes from the interaction of non-homothetic demand with sectoral labor-market heterogeneity, which makes inflation in discretionary sectors a particularly informative guide for stabilizing the welfare-relevant output gap.

Finally, our analysis contributes new Euro-area measurement to the strand of work on monetary transmission in Europe, following Smets and Wouters (2003), Altavilla et al. (2019, 2024), Jarociński and Karadi (2020). By constructing necessity-discretionary time series for consumption, inflation, employment, and other macroeconomic outcomes, we isolate a dimension of transmission that is missed by more standard decompositions into durables and non-durables, services and goods, or tradables and non-tradables. This measurement contribution is central to the paper broader argument, because it provides the empirical discipline for the model and the optimal-policy analysis for the European Central Bank.

**Rest of the paper.** In Section 2, we construct new Euro-area time series for necessity and discretionary consumption, inflation, and employment, and document their cyclical behavior. In Section 3, we estimate the effects of monetary policy shocks and show that quantities (price) adjust primarily in discretionary (necessity) sectors. In Section 4, we lay out a New Keynesian model consistent with these facts. In Section 5, we use the model to derive a welfare criterion, quantify the implied weight on the output gap, and evaluate alternative interest rate rules that vary the weight on necessity and discretionary inflation. The Appendices contain details on data construction, additional empirical results, and model derivations.

# 2 Data

This section constructs new Euro-area time series that decompose consumption, inflation, and employment into necessity and discretionary components, and uses them to characterize their cyclical behavior. We document a systematic asymmetry: discretionary sectors drive the dynamics of quantities, while necessity sectors account for most of the variation in prices. By contrast, we find little asymmetry in the frequency of wage adjustment and only limited differences in the frequency of price adjustment across sectors. We also show that the necessityâdiscretionary distinction captures a dimension of heterogeneity that is distinct from standard classifications based on durables versus non-durables or tradable versus non-tradable goods. These facts provide the empirical discipline for the model and the optimal policy analysis that follow.

## 2.1 Data Construction

Our first step is to construct a rich dataset tracking necessity and discretionary economic activity across multiple macroeconomic dimensions in the Euro Area, built from a range of detailed micro-dataset. We start by building on a classification of consumption categories into necessity and discretionary goods, which we extend to the production side via input-output analysis to identify industries whose output is primarily necessity or discretionary in nature. Using this framework, we construct quarterly time series for consumption, prices and employment, in addition to a range of supplementary variables reflecting financial market valuations, dividends, and national accounts aggregates. Technical details of all data construction steps are provided in Appendix A.

**Consumption classification.** We classify consumption categories following the UK Office for National Statistics (ONS), which assigns COICOP 4-digit categories into necessity (goods satisfying basic or legally required needs) and discretionary (optional or deferrable expenditures). We adapt this to Eurostat data, available at the COICOP 3-digit level, by assigning each 3-digit category to the majority classification of its 4-digit components. The resulting classification aligns closely with Andreolli et al. (2024) and the Engel curve-based approach of Aguiar and Bils (2015); the detailed mapping is tabulated in Appendix A.1.2.

**Consumption and price series.** Annual necessity and discretionary real consumption indices are constructed from Eurostat National Accounts data ("Households Final Consumption by Purpose"), following the Eurostat chain-linking methodology with 2015 as the reference year. Quarterly growth rates are obtained by interpolating the annual series using quarterly household consumption data from Italy (ISTAT) and Germany (DESTATIS) via the Chow and Lin (1971) procedure. Price indices are built from monthly HICP data at the COICOP 3-digit level from Eurostat, following the standard HICP aggregation and chain-linking methodology. In Appendix B.3.2 we show the distinction between the discretionary and necessity price series and core inflation; items in core inflation are disproportionately discretionary, but core inflation also includes 30% of the consumption basic which are necessities. The final consumption and price series cover 1997Q1-2024Q2 and 1998Q1-2024Q2, respectively; construction details are in Appendix A.1.3.

**Industry classification.** To extend the necessity-discretionary framework to the supply side, we classify NACE Rev.2 2-digit industries following the methodology of Andreolli et al. (2024). Industries are separated into "final" and "intermediate" groups, with final industries assigned based whether their output is discretionary or necessity. Intermediate industries are classified by computing the Leontief inverse of the euroarea input-output table and to compute indirect contributions to necessity and discretionary final demand. The procedure yields 20 necessity industries, 37 discretionary industries, and 5 unclassified under NACE Rev. 2, with a consistent mapping for NACE Rev. 1 before 2008. The full classification is in Table A.5; construction details are in Appendix A.1.5.

**Labour market.** Quarterly employment series by sector are constructed from the Eurostat Labour Force Survey. We adjust for changes in the industry classification in the survey. We primarily focus on employment rates scaled by total Euro Area population (Appendix A.1.6). To characterise the distributional exposure of workers, we use ECB Household Finance and Consumption Survey (HFCS) Wave 2 data to compute the share of hand-to-mouth households, defined following the approach of Slacalek et al. (2020) and Kaplan et al. (2014), and employed in necessity and discretionary sectors across income quintiles (Appendix A.1.7).

**Frequency of price and wage adjustment.** The frequency of price changes across necessity and discretionary sectors is computed from 135 million granular price quotes underlying the HICP at the COICOP 5-digit level for eleven Euro-area countries, using the work of Gautier et al. (2024). The frequency of wage changes is computed from the ECB Wage Tracker, which covers negotiated wages at the NACE Rev. 2 sectoral level for seven Euro-area countries from (Bates et al., 2025). Further details are in Appendix A.1.8.

**Supplementary data series.** We also construct several additional series whose analysis is reported in Appendix A: necessity and discretionary stock price and dividend indices from firm-level Eikon data for EURO STOXX 600 constituents; series for gross value added, compensation of employees, and operating surplus by sector from disaggregated national accounts data; and necessity and discretionary wages from the ECB Wage Tracker.

## 2.2 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 substantial 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.

**Necessity and Discretionary Sectors across Euro-Area Business Cycles** The first two columns of Figure 1 illustrate the cyclical dynamics of necessity and discretionary sectors across consumption, inflation and employment rates 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. We also note that at times discretionary series can be leading indicators of business cycle dynamics; we show this formally in Appendix Section B.2

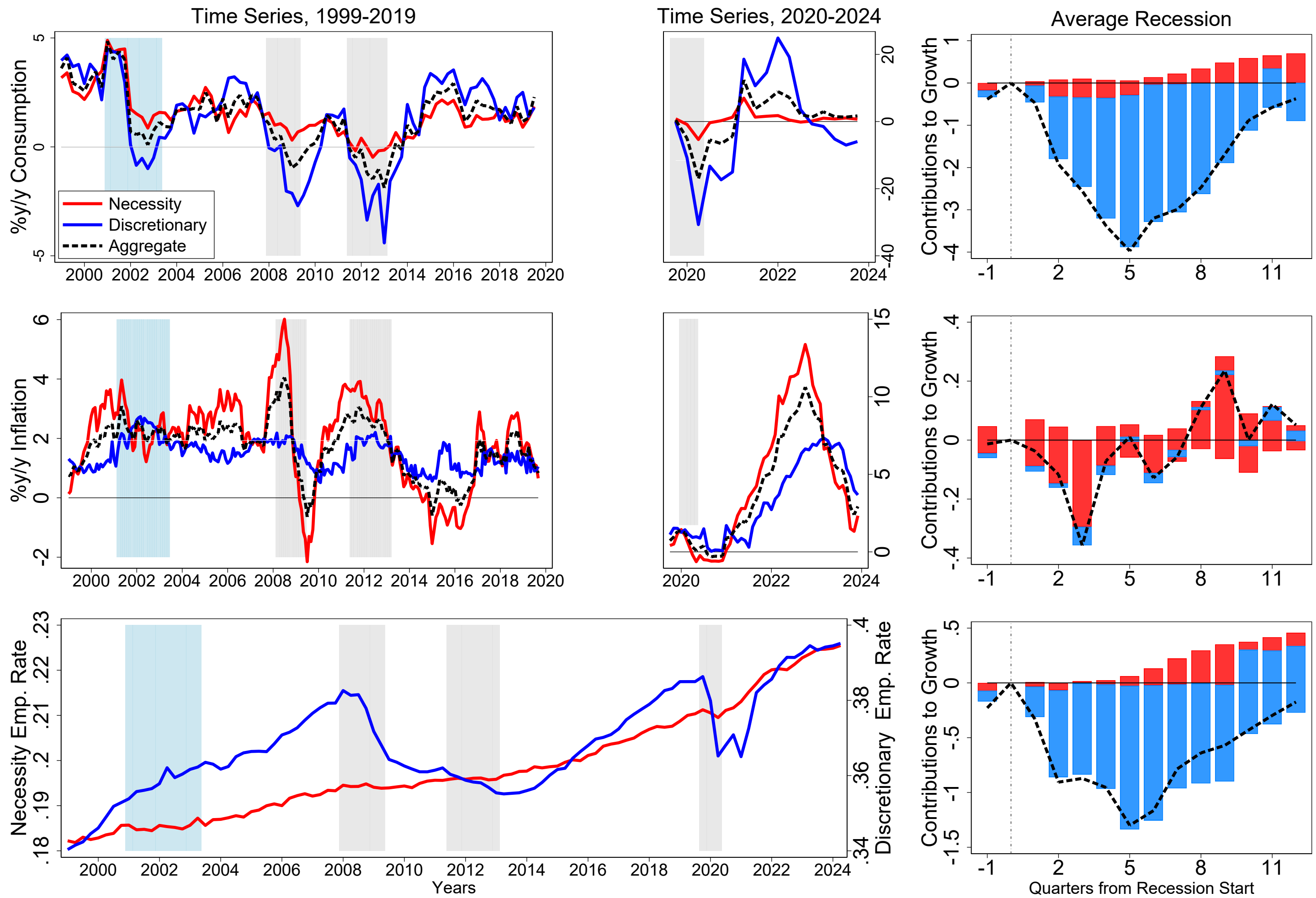
The third column of Figure 1 examines the behaviour of consumption, employment and inflation during the three last recessions in the Euro Area. The aim is to understand the relative contributions of necessity and discretionary sectors to aggregate dynamics during recessions. Specifically, we present the decomposition of changes in consumption growth, employment rates and inflation, averaged across the Great Financial Crisis, the Sovereign Debt Crisis, and the COVID-19 Pandemic, relatively to the start of each of these recessions.

The slowdown in aggregate consumption during recessions 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 96% of the contractionary dynamics of aggregate consumption and aggregate employment, respectively. In contrast, discretionary spending inflation is responsible for only an average 14% across these three recessions. Detailed calculations underlying these analyses are further elaborated in Appendix A.1.11. 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.

In Appendix Section B.1, we show that the pro-cyclicality of discretionary activity documented above extends beyond consumption and employment to a broader set of macroeconomic aggregates. Within the national accounts, gross value added, compensation of employees, and operating surplus in discretionary industries are all substantially more cyclical than their necessity counterparts. Furthermore, we map industries into financial data and find that discretionary stock returns and dividends exhibit the same pattern, consistent with

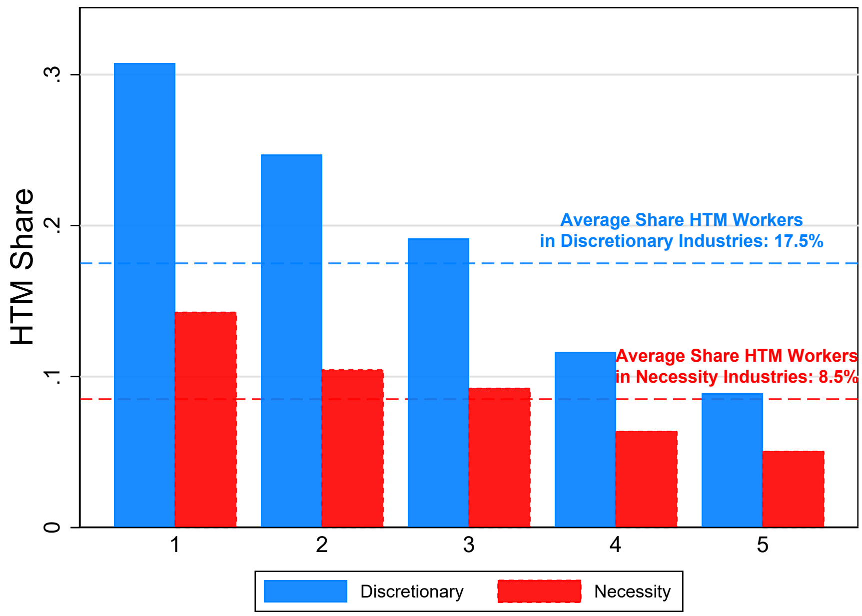
Figure 1: Consumption, Inflation and Employment.




*Notes:* The first two columns present time series of consumption, inflation and employment rate both in aggregate and disaggregated into necessity and discretionary goods and industries. The data is derived from Eurostat and National Accounts. The consumption series are reported as annual growth rates at the quarterly frequency, the inflation series are reported in annual changes at the monthly frequency, the employment rate series are reported at the quarterly frequency. The shaded areas represent NBER (in light blue) and EABCN (in grey) recessions. The third column reports the quarterly unconditional responses of consumption, prices and employment rates-both in aggregate and disaggregated into necessity and discretionary components, as averages across the Global Financial Crisis, the Sovereign Debt Crisis, and the COVID-19 pandemic, where recession dates are defined according to the EACBN. 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.

investors pricing in the higher income sensitivity of discretionary revenues. One notable exception is negotiated wages, which show no discernible difference in cyclical dynamics across the two sectors, consistent with the similar frequencies of wage adjustment documented in Section 2.2.

Figure 2: Hand-to-Mouth Workers in Necessity and Discretionary Industries




*Notes:* The 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. The calculations are based on data from the ECB-HFCS, and following the methodology of Slacalek et al. (2020) to identify Hand-to-Mouth Households.

**Heterogeneity in Labor Force Composition** In Figure 2, we present the share of hand-to-mouth (HTM) households employed in necessity and discretionary sectors across quintiles of the income distribution in the Euro Area, constructed using data from the ECB-HFCS [2]. Two main findings emerge. First, discretionary industries exhibit a share of HTM workers that is almost two times larger than that observed in necessity industries – 17.5% versus 8.5%, on average across all income quintiles. Second, this sectoral gap is particularly pronounced at the bottom of the income distribution, with around 31% of workers in discretionary industries classified as HTM in the lowest quintile, compared to only about 15% in necessity industries. The difference steadily narrows among higher earners, falling to roughly 8.6% in discretionary and 5% in necessity industries in the top income quintile. These patterns high-

[2]Detailed calculations are explained in Appendix A.1.7

light 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 an amplification mechanism for macroeconomic shocks, consistent with the results for the U.S. by Andreolli et al. (2024).

**Frequency of price and wage adjustments** Our descriptive evidence in Figure 1 shows a higher volatility in necessity prices than discretionary prices. In this section we further demonstrate that prices in necessity sectors are adjusted more frequently. Table 1 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 (see Appendix Section A.1.8 for details). 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. 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 smaller and thus more rigid than for prices.

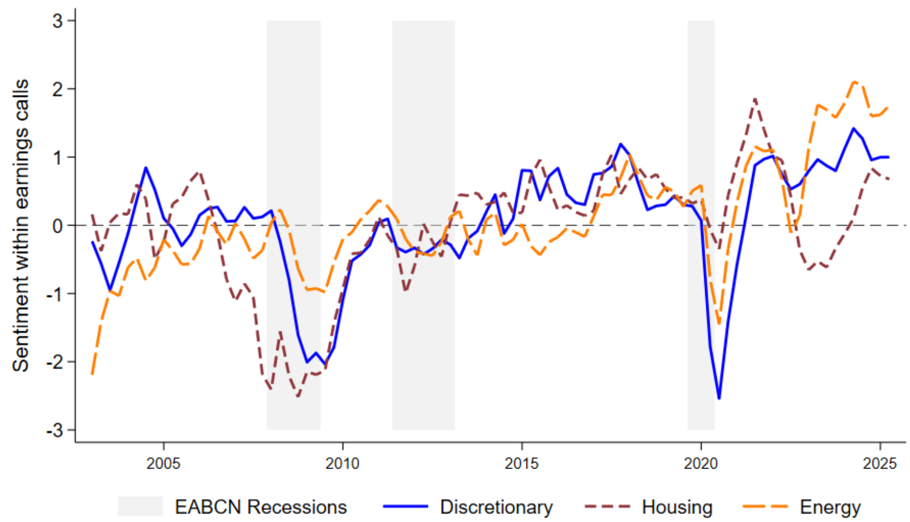
Table 1: Nominal rigidity across discretionary and necessity sectors

| | Prices | | Wages | |
|---|---|---|---|---|
| **Sector** | All | Excl. sales | All | Excl. 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 |

*Note:* Values are average frequency of price changes per month (%). Results 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).

**Alternative consumption classifications** Our necessity-discretionary classification captures a dimension of heterogeneity that is distinct from the conventional breakdown into durables, non-durables, and services. While virtually all durable spending is discretionary, significant fractions of services (16.3%) and non-durable goods (8.2%) are also discretionary, so that in total discretionary goods account for 42.7% of the Euro-area consumption basket.

Figure 3: Discretionary spending is the cycle




*Notes:* Indices constructed based on NLAnalytics sentiment within earning calls around keywords relating to discretionaries, energy and housing. Sentiment scores are aggregated across euro-area headquartered firms using equal weights, and the figure shows a two-quarter moving average for each index to smooth seasonal reporting. EABCN recession dates shared. See Appendix A.1.4 for further details of NLAnalytics data processing.

Within each durability category, discretionary consumption is more volatile than its necessity counterpart, with discretionary services proving as volatile as durable goods—an expenditure category that, by our classification, is itself entirely discretionary. Our classification is likewise distinct from the tradable/non-tradable divide—a classification that Boehnert et al. (2025) show interacts importantly with household heterogeneity in shaping monetary policy transmission across euro-area countries: discretionary items account for around 60% of tradable expenditure but only 30% of non-tradable expenditure. These results, detailed in Appendix B.3, suggest that the necessity-discretionary margin captures economically meaningful variation that would be obscured by classifying goods along the durability or tradability dimensions alone. Finally, we show how core inflation classifications compare with the necessity-discretionary distinction in Appendix Section B.3.2; to focus on discretionary inflation requires removing another 30% of the consumption basket within core which we classify as necessities.

## 2.3 Discretionary spending is the cycle

Discretionary spending declines, documented in the previous section, appear to be an overriding consistent driver of recessions. Figure 3 shows that sentiment around discretionary consumption deteriorates sharply and consistently during euro-area recessions. This contrasts with sentiment around other commonly cited drivers of downturns, such as housing and energy, which declines only in the specific episodes where those sectors are directly implicated. The figure is based on firm-level sentiment data extracted from earnings call transcripts using NLAnalytics, based on the approach of Hassan et al. (2019). NLAnalytics applies natural language processing to quantify how firms discuss specific topics during their quarterly earnings calls. We focus on firms headquartered in the euro area and construct topic-specific sentiment indices that track the tone of corporate discussion over time, for keywords relating to discretionary consumption, housing, or energy. Further details on the index construction are included in Appendix Section A.1.4. These indices provide a forward-looking, firm-based measure of how expectations and narratives evolve across recessions.

Housing sentiment falls markedly during the 2008-09 financial crisis but remains relatively stable in other periods. Energy sentiment drops sharply in the 2020 COVID-19 recession but is otherwise flat. In contrast, discretionary sentiment contracts in every recession in the sample. This pattern suggests that deteriorating sentiment around discretionary spending are typical of business-cycle contractions, while other sectoral narratives are more episodic, depending on the particular circumstances of a given recession. In this sense, discretionary spending appears to be the consistent margin through which downturns propagate.

# 3 The Dynamic Effects of Monetary Policy Shocks

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

## 3.1 Empirical Framework and Identification

To estimate the impact of monetary policy on our variables of interest-across necessity and discretionary economic activities, we employ an array of structural BVARs at quarterly frequency, closely following the approach of Jarociński and Karadi (2020). In our main specification, we rely on their *poor man's sign restrictions* identification of monetary policy shocks. These are high-frequency surprises in 3-month EONIA interest rate swaps around ECB monetary policy announcements, restricted to periods in which stock price surprises move in the opposite direction.[3] We cumulate the shock quarterly, to match the frequency of our macroeconomic variables.

We estimate an array of BVARs using Litterman Priors, 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 Jarociński and Karadi (2020) and account contemporaneously for both monetary policy and central bank information shocks in our specification. To avoid the curse of dimensionality, we add one necessity/discretionary variable at a time to the baseline specification of Jarocinski and Karadi. Specifically, for each of our necessity/discretionary variable we estimate:

$$\begin{pmatrix} m_t \\ y_t \end{pmatrix} = \sum_{p=1}^{P} \begin{pmatrix} 0 & 0 \\ B^p_{YM} & B^p_{YY} \end{pmatrix} \begin{pmatrix} m_{t-p} \\ y_{t-p} \end{pmatrix} + \begin{pmatrix} 0 \\ c_Y \end{pmatrix} + \begin{pmatrix} u^m_t \\ u^y_t \end{pmatrix}, \quad \begin{pmatrix} u^m_t \\ u^y_t \end{pmatrix} \sim \mathcal{N}(0, \Sigma) \qquad (1)$$

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: GDP (log), HICP (log), 1-year yield, stock price index (log), the BBB-AA corporate bond spread and the unemployment rate[4]. The vector $m_t$ contains the "poor man" monetary policy and central bank information shocks. Note that $m_t$ doesn't depend on the lags of either $y_t$ or $m_t$ and has zero mean.

Our Structural BVARs are implemented at the quarterly frequency and include four lags of $y_t$. For most of our analyses, we use data from 1999q1-2024q2, but for disaggregated price indices we start from 2003q1. In Appendix C, we report the estimated IRFs of the baseline set of variables, which are consistent with those in Jarociński and Karadi (2020). We also show that the results are robust to excluding the covid pandemic period and its subsequent inflation, and using an alternative, sign-restriction based approach that allows both central bank and information shocks to be non-zero in the same period.

[3] Jarociński and Karadi (2020) distinguish monetary policy surprises from central bank information shocks, combining high frequency identification with sign restrictions. As in standard high-frequency identification, the first assumption is that announcement surprises in OIS rates and the EURO STOXX 50 in tight intervals around policy events are affected only by the policy announcements and not by other shocks. To distinguish monetary policy from information shocks, the second assumption is that monetary policy shocks generate negative co-movements between interest rates and stock prices, while central bank information shocks generate positive co-movements.

[4] The specification mirrors Jarociński and Karadi (2020), with the addition of the unemployment rate.

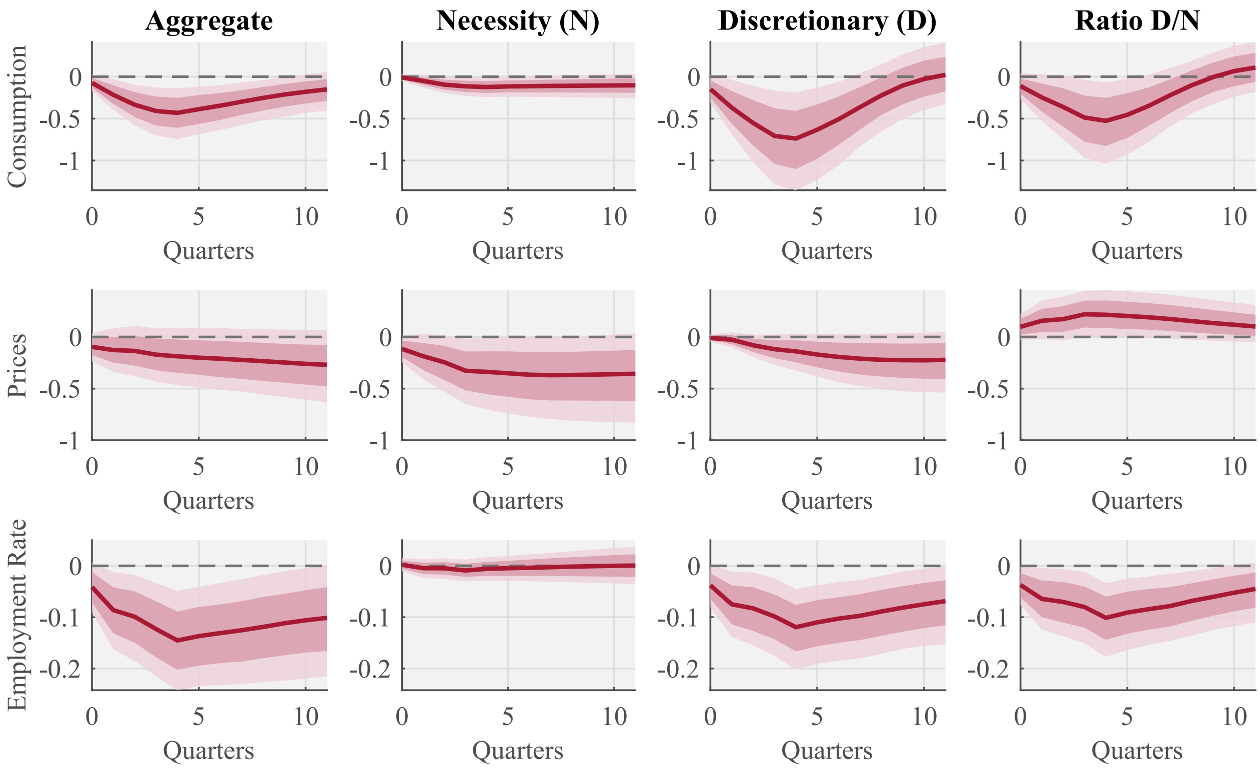
## 3.2 The unequal effects of monetary policy

In Figure 4, we illustrate the heterogeneous responses of discretionary and necessity macroeconomic variables to monetary policy shocks. Specifically, the figure reports impulse response functions 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 a monetary policy shock. 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. In independently developed research, Gareis and Minasian (2025) also find heterogeneity in consumption responses to monetary policy shocks of a similar magnitude. 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.

Figure 4: Estimated IRFs to a contractionary monetary policy shock




*Notes:* IRFs in response to a one standard deviation monetary policy shock of consumption, HICP and employment rate. IRFs are from a BVAR on a quarterly sample 1999q1-2024q2. 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,central bank information shocks, 1y yield, GDP (log), HICP (log), stock index (log), unemployment rate, BBB-AA corporate bond spread). See text for full specification details and Appendix for IRFs of baseline controls.

Appendix C presents IRFs based on the ECB wage tracker, and shows that wage adjustments appear similar across both sectors, 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.[5] Appendix C also shows that the cyclicality observed in discretionary goods also manifests prominently across several other key macroeconomic dimensions: stock market dynamics, firms dividend distribution, gross value added, compensation of employees and operating surplus.

[5]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.

# 4 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 in our empirical analysis on the Euro area in the previous sections. This model provides a laboratory to explore the implications of different monetary policy stances; in particular, the benefits of focussing on and respond mostly to discretionary spending inflation.

The theoretical set up follows the model presented in Andreolli et al. (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. All households $i = \{H, L\}$ face the same non-homothetic utility function, which in each period takes the following form:

$$U(C_{i,t}^N, C_{i,t}^D, N_{i,t}) = \frac{\left(C_{i,t}^N\right)^{1-\frac{1}{\gamma^N}}}{1-\frac{1}{\gamma^N}} + \varphi \frac{\left(C_{i,t}^D\right)^{1-\frac{1}{\gamma^D}}}{1-\frac{1}{\gamma^D}} - \xi \frac{N^{1+\chi}}{1+\chi} \tag{2}$$

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 governing the utility function are the Intertemporal Elasticity of Substitution (IES) for necessities $\gamma^N$ the IES for discretionaries $\gamma^D$, the Frish elasticity $\chi$, the scaling parameter for the relative weight of discretionaries $\varphi$, and the scaling parameter for the disutility of labour $\xi$.

The good with the higher IES will also have a higher Income Elasticity of Demand (IED). $\gamma^D > \gamma^N$ implies that: (i) Discretionaries are consumed relatively more by higher income households, that it is, discretionary is a luxury good; (ii) Discretionaries are easier to shift intertemporally. The intuition is that it is easier to postpone a vacation than grocery. A main advantage of our utility function formulation is that it allows us to make a transparent mapping between the IES and the IED, though this is a general property of non-homothetic utility functions. Indeed, Browning and Crossley (2000) prove that luxury goods and services are easier to shift intertemporally for utility function that is separately additive in goods. Andreolli and Surico (2021) 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 $\lambda$. This allows the model to generate a hump shape response of consumption to a monetary policy shock consistent with the empirical evidence presented in Figure 4. 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:

$$Y_t^N = A_t^N (N_{L,t}^N)^{\alpha^N} (N_{H,t}^N)^{(1-\alpha^N)} \quad \text{and} \quad Y_t^D = A_t^D (N_{L,t}^D)^{\alpha^D} (N_{H,t}^D)^{(1-\alpha^D)} \tag{3}$$

where, for each sector $i = \{N, D\}$, $Y_t^i$ 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, $N_{H,t}^i$ refers to high skilled workers, and $\alpha^i$ is the share of low skilled labour employed in that sector. Consistent with the empirical evidence for the Euro area presented in Figure 2, 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 a la Calvo. The price stickiness in the two sectors potentially differs, with price stickiness being $\theta^N$ in the necessity sector and $\theta^D$ in the discretionary sector. 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 necessity vs discretionary inflation. The linearized Taylor rule takes the form:

$$\hat{R}_t = \rho_R \hat{R}_{t-1} + (1-\rho_R)(\phi_\pi E(\hat{\pi}^{\text{target}}_{t+1}) + \phi_Y \hat{Y}_t) + \sigma_R \varepsilon_{R,t} \tag{4}$$

$$\hat{\pi}^{\text{target}}_{t+1} = \omega \hat{\pi}^D_{t+1} + (1-\omega)\hat{\pi}^N_{t+1} \tag{5}$$

Where $\hat{R}_t$ is the nominal interest rate, $\hat{\pi}^{\text{target}}_{t+1}$, $\hat{Y}_t$ is the output gap, $\hat{\pi}^N_{t+1}$ is the inflation rate of necessity goods and services, $\hat{\pi}^D_{t+1}$ 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 $\phi_\pi$, the response to the output gap $\phi_Y$, and the weight on discretionary spending inflation in the targeted inflation rate, $\omega$. Targeting headline CPI inflation is achieved by setting this parameter equal to the economy wide share of the discretionary goods: $\omega = \bar{C}^D$. Finally, $\rho_R$ governs the degree of interest rate smoothing and $\sigma^R$ 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. $\eta$ is consistent with the evidence of Christiano et al. (2010) and $\mu_L$ with our calculation in Section 2 and 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) is the source of the persistence of the cost push shock $\rho_X$ and of the monetary policy rule $\rho_R$. We use a value of $\lambda$ of 0.1, which sits between the structural estimation from Beraja and Wolf (2021) and Auclert et al. (2020) and the empirical estimates of Coibion and Gorodnichenko (2012). $\beta$ is standard, $\xi$, $\sigma_R$, and $\sigma_X$ are scaling parameters. $\gamma^N$ and $\gamma^D$ are borrowed from Andreolli et al. (2024), who estimate them on U.S. data, these parameters yield an aggregate intertemporal elasticity of substitution of 0.528, which is consistent with the estimates by Smets and Wouters (2003) for the Euro Area, and a income elasticity of demand for discretionaries of 1.863 and for necessities of 0.411, which are consistent with Engle curve estimates for the European Union by Temursho and Weitzel (2024). We choose $\alpha^N$ and $\alpha^D$ so that we hit the share of hand-to-mouth workers in the necessity and discretionary sectors in the overall labor force, consistent with with ECB-HFCS data and the share of necessity consumption by low skilled and high skilled households from the Eurostat-Household Budget Surveys data. Finally, the Calvo parameters $\theta^N$ and $\theta^D$ are calibrated with the evidence for prices that we report in Table 1 to be the quarterly counterparts of the frequency of price changes per month.

**Impulse response functions.** Figure 5 presents the impulse response functions (IRFs) to a contractionary monetary policy shock generated by the model. The responses replicate the patterns observed in the data. Discretionary consumption falls significantly more than necessity consumption, as it is easier for Ricardian households, who adjust along their Euler equation, to postpone such spending, and for hand-to-mouth households, who adjust along the Engel curve, to reduce it. In contrast, necessity prices decline more sharply than discretionary prices because they are less sticky. Finally, labour earnings decrease more in discretionary sectors, where hand-to-mouth households are more heavily employed, contributing to the amplification mechanism.

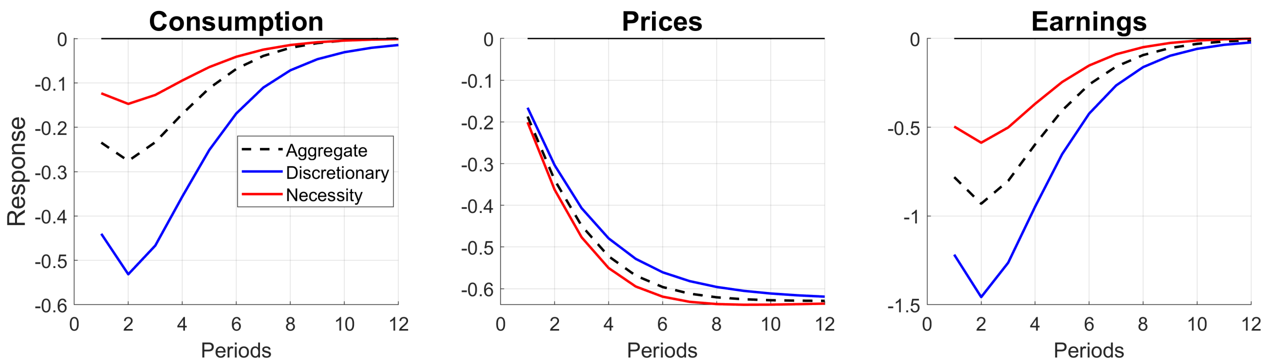
Table 2: Model Parameters

| Description | Parameter | Value |
|---|---|---|
| IES for necessities | $\gamma^N$ | 0.216 |
| IES for discretionaries | $\gamma^D$ | 0.986 |
| Low skilled share in necessities | $\alpha^N$ | 0.126 |
| Low skilled share in discretionaries | $\alpha^D$ | 0.347 |
| Price stickiness in necessities | $\theta^N$ | 0.8306 |
| Price stickiness in discretionaries | $\theta^D$ | 0.7217 |
| Time preference | $\beta$ | 0.99 |
| Inverse of the macro Frisch elasticity | $\eta$ | 0.1 |
| Dis-utility of working scaling parameter | $\xi$ | 1 |
| Relative utility for discretionaries scaling parameter | $\varphi$ | 1 |
| Elasticity of substitution across varieties | $\varepsilon$ | 2 |
| Fraction of hand-to-mouth/low-skilled households | $\mu_L$ | 0.2596 |
| Attentive share of households | $\lambda$ | 0.1 |
| Interest rate rule coefficient on targeted inflation | $\phi_\pi$ | 1.25 |
| Interest rate rule coefficient on output gap | $\phi_y$ | 0.125 |
| Interest rate rule coefficient on discretionary inflation in targeted inflation | $\omega$ | 0.4055 |
| Interest rate smoothing | $\rho_R$ | 0.8 |
| Standard deviation of the monetary policy shock | $\sigma_R$ | 0.255 |
| Persistence of the cost-push shock | $\rho_X$ | 0.9 |
| Standard deviation of the cost-push shock | $\sigma_X$ | 0.05 |

*Notes:* The baseline interest rate rule coefficient on discretionary inflation in targeted inflation ($\omega$) is calibrated to hit the steady state share of discretionary good consumption in the overall economy ($\bar{C}^D$).

In Appendix D, we summarize the full set of equilibrium conditions and the algorithm to compute the steady state.

Figure 5: Model IRFs to a contractionary monetary policy shock




*Notes:* This figure shows the IRFs to a contractionary monetary policy shock. They show the percent change in aggregate consumption, prices, and labour earnings and their discretionary and necessity counterparts.

# 5 Optimal Monetary Policy

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. In this section, we ask if these interacting heterogeneities matter for the conduct of optimal monetary policy. We show that the dynamics of discretionary spending imposes a substantial departure from the popular normative prescription of headline CPI inflation targeting. First, we show that the central bank should increase the weight on the output gap relative to inflation compared to models which only feature household heterogeneity or sectoral heterogeneity in isolation. Second, we show that monetary policy can achieve a superior outcome for society by targeting only discretionary spending inflation.

## 5.1 Deriving a Welfare Criterion

We follow the standard approach in the literature, presented in Woodford (2003b) 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. Welfare is defined given some Pareto weights: $\lambda_H$ and $\lambda_L$:

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

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 (2025), 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 E, we show that by taking a second order Taylor approximation of the welfare function and by using the static equilibrium conditions of the model, the welfare loss function can be approximated in the following form:

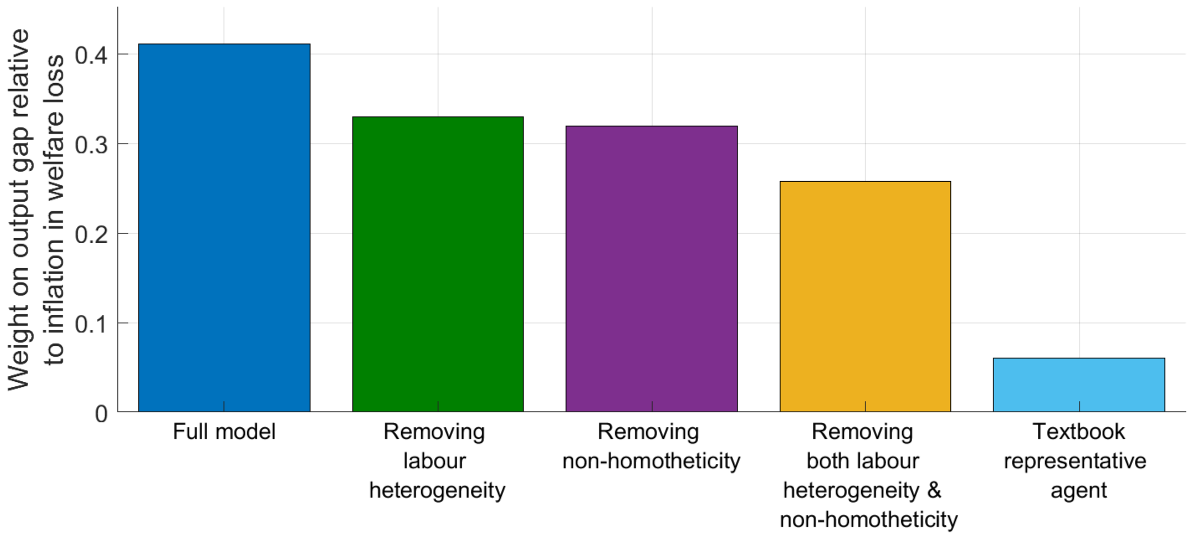
$$-2\sum_{t=0}^{\infty}\beta^t\frac{\mathcal{W}_t-\mathcal{W}}{C}\approx\sum_{t=0}^{\infty}\beta^t\big[a_{(\pi^N)^2}[\hat{\pi}_t^N]^2+a_{(\pi^D)^2}[\hat{\pi}_t^D]^2+a_{(C)^2}\hat{C}_t^2+a_{(p^D)^2}(\hat{p}_t^D)^2+a_{(C,p^D)}(\hat{p}_t^D\hat{C}_t)\big]+t.i.p. \tag{6}$$

Welfare decreases with: (i) higher inflation variability in either necessity or discretionary goods; (ii) higher variability in the output gap; (iii) a higher variability in the 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. This loss function is reminiscent of Aoki (2001), Woodford (2003a), 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.

It is well known in the representative-agent literature with heterogeneous price stickiness that a welfare-maximizing central bank should target inflation in the sector with higher price rigidity (Aoki, 2001, Benigno, 2004). However, the focus of this paper is on how demand cyclicality interacts with household and labor market heterogeneity. For this reason, our baseline analysis considers an economy with homogeneous price stickiness across sectors. In particular, we set the average degree of price stickiness so that the welfare function is not distorted.[6] Nevertheless, in Section 5.3, we show that allowing discretionary goods to have higher price stickiness strengthens our main result: the case for targeting discretionary-sector

[6]Specifically, we choose the average price stickiness such that $a_{(\pi^N)^2}+a_{(\pi^D)^2}$ is identical in both the homogeneous- and heterogeneous-stickiness economies. As $a^2_{(C)}$ does not depend on the degree of price stickiness, the inflation-output trade-off remains the same across the two cases. Appendix E.1 details the derivation.

Figure 6: Welfare loss function




*Notes:* The 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: $a_{(C)^2}/(a_{(\pi^N)^2} + a_{(\pi^D)^2})$. 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 averages.

inflation becomes even stronger.

In our first exercise, we start from the full model featuring three sources of heterogeneity and remove them sequentially to arrive at a textbook representative-agent model similar to Woodford (2003a). First, we eliminate non-homothetic preferences by setting $\gamma^N = \gamma^E = IES$ , equal to the average intertemporal elasticity of substitution in the economy. Second, we remove labour force heterogeneity by setting $\alpha^N = \alpha^D = \alpha^{avg}$, so that hand-to-mouth households retain the same aggregate economic weight as in the baseline economy but work equally across sectors. Third, we jointly remove non-homothetic preferences and labour force heterogeneity, yielding a standard TANK/HANK specification that features only hand-to-mouth households. Finally, we set the share of hand-to-mouth households to zero ($\alpha^N = \alpha^D = 0$ and $\mu_L = 0$) and impose homothetic preferences, obtaining the representative-agent benchmark.

The results of this exercise are shown in Figure 6, which reports the ratio of the coefficients on the variance of the output gap and inflation in the welfare loss function for the full model and its restricted versions. A key takeaway is that the full model places substantially greater emphasis on the output gap than any of the restricted specifications. In the simplest "textbook" representative-agent model, without sectoral labour market heterogeneity, hand-to-mouth households, or non-homothetic preferences, the relative weight on the output gap is only 0.06 (light blue bar), implying that little attention should be paid to output stabilization. This reproduces the standard result from the representative-agent literature that the central bank should focus primarily on inflation stabilization. We also confirm that introducing household heterogeneity alone does not substantially alter this conclusion: the relative weight on the output gap rises only to 0.26. By contrast, in the full model the weight increases to 0.41 (dark blue bar), nearly seven times larger than in the representative-agent benchmark. The intermediate bars show that each feature of the model contributes to the greater importance of output stabilization. When households reduce discretionary spending during downturns and hand-to-mouth households are disproportionately employed in these sectors, fluctuations in consumption become more costly relative to the misallocation generated by price stickiness.

Several points are worth emphasizing. First, the relatively high weight on the output gap (0.41) emerging from our fully micro-founded framework is notable in its own right. It provides a microfoundation for the common practice in policy analysis of assuming that a dual-mandate central bank assigns comparable weights to inflation and output stabilization.

Second, this result is derived solely from the welfare function and the static relationships of the model. As a result, it does not depend on the specification of a particular policy rule or on the nature of the structural shocks hitting the economy. The implication that the central bank should place greater weight on output stabilization therefore arises only from the interaction between spending patterns and labour force composition across sectors.

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, for instance, 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 policy even further towards monetary accommodation.

## 5.2 A greater focus on discretionary spending inflation

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 and discussed the different weights that the central bank should place on the output gap compared to inflation depending on model features. In this section, we are going to study the implied policy implications by focusing 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.

We use this laboratory to evaluate alternative policy rules, by computing variable moments, simulating the model under alternative scenarios, and evaluation welfare with the un-approximated welfare function (8). 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 $\omega = \bar{C^D}$.

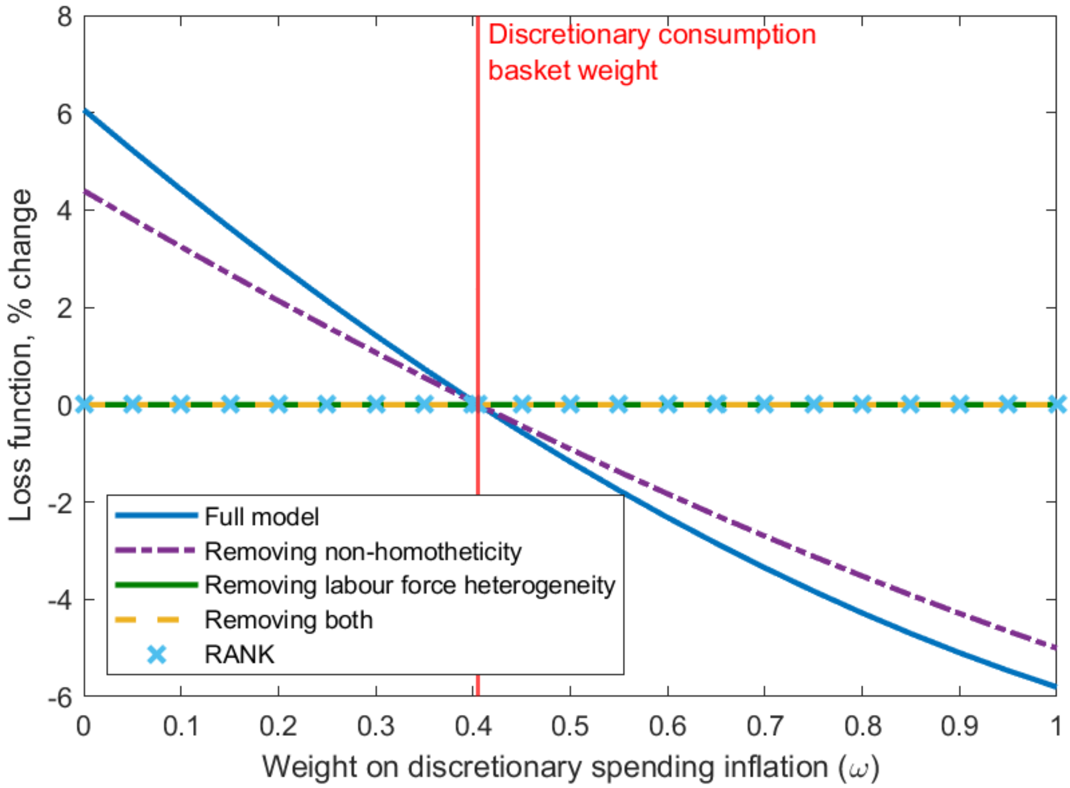
We then vary $\omega$ from targeting only necessity inflation $\omega = 0$ to only targeting discretionary inflation $\omega = 1$. We perform the same analysis in our baseline model, with all the sources of heterogeneity turned on and then using a battery of restricted models that progressively turn 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 relative to the existing literature which focuses on either asymmetric disturbances (Guerrieri et al., 2021, Olivi et al., 2025) or heterogeneous price stickiness (Aoki, 2001, Benigno, 2004). A main contribution of our analysis is to show that even with symmetric shocks and symmetric nominal rigidities across sectors, the central bank still faces an incentive to move interest rate in response to sectoral inflation, due to the interaction between cyclical product demand and sectoral labour force composition.

In Figure 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 (i.e. the loss declines). 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.

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) 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

Figure 7: Welfare loss for range of weights on discretionary inflation $\omega$




*Notes:* The expression for the welfare loss function is specified in text. Its value is calculated for different levels of 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. RANK stands for representative agent models, with and without non-homotheticity, which give the same results.

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.

One interpretation of the optimality of targeting only discretionary spending inflation is that the dynamics of business cycles are driven by 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 stabilizing the output gap by moving interest rates mostly in response to discretionary inflation 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 the fortuitous consequence of closing the output gap.

## 5.3 Sensitivity

In the next section, we expand on the result that the central bank should target discretionary inflation. We explore how the result change if we explore a central bank with no redistributive motive, if we allow for price stickiness heterogeneity, and the relative magnitude of the importance of which inflation to target compared to how strongly to target inflation.

**Targeting inflation with no redistributive motive.** Next, we study an ad-hoc quadratic loss function which features only the stabilization of CPI inflation and the output gap. We do this, for two main reasons. First, many central banks have a mandate over CPI inflation and the output gap only, and therefore we can place our results within existing monetary policy frameworks. Secondly, focusing only on inflation and output stabilization allows us to make explicit an objective that fully abstracts from inequality considerations, whether in steady state or during cyclical fluctuations: the central bank only cares about aggregate outcomes. Accordingly, the loss function takes the following form:

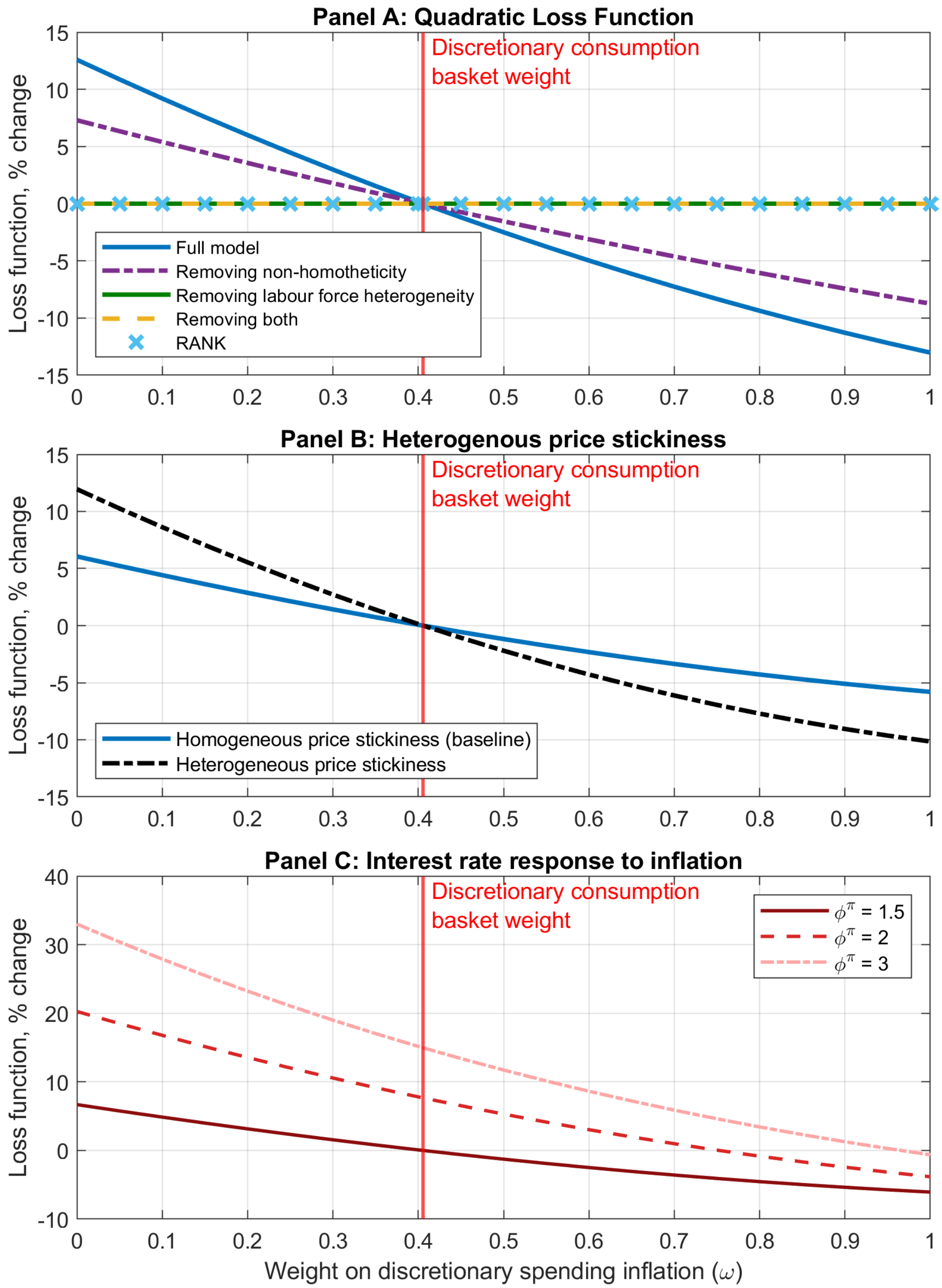
$$\text{Loss}_t = (\hat{\pi}_t^{CPI})^2 + \psi(\hat{Y}_t)^2 \tag{7}$$

In this experiment, we set the relative weight of the output gap in the loss function, $\psi$, to 0.5. Similarly to the exercise with the welfare-based loss function in Figure 7, in these model simulations, we vary the share of discretionary spending in the price index targeted by the central bank, and then we perform the same exercise with progressively simpler models. The results are shown in panel A of Figure 8.

All the results work in the same way as in our welfare-based loss function. In the full model, shown with the solid blue line, targeting discretionary inflation reduces the loss compared to responding to CPI inflation or to necessity inflation. This happens despite having a central bank that only cares about the overall output gap and CPI inflation, but not about inequality per se. Targeting discretionary inflation lowers the business cycle volatility and therefore improves aggregate outcomes for a central bank that only cares about stabilizing headline inflation and the output gap.

Interestingly, this result goes beyond the finding in McKay and Wolf (2022) who, using a

Figure 8: Robustness for welfare loss for range of weights on discretionary inflation $\omega$




*Notes:* The expression for the welfare loss function is specified in text. In each panel, we compute the loss function for different levels of the weight in the Taylor rule on necessity inflation $\omega$ (across the x axis) and for different model scenarios (different lines). In Panel A, we evaluate a quadratic ad-hoc loss function: $(\hat{\pi}_t^{CPI})^2 + \psi(\hat{Y}_t)^2$. RANK stands for rapresentative agent models, with and without non-homoteticity, that give the same results. In Panel B, we contrast the model with price stickiness homogeneity with the model with price stickiness heterogeneity. In Panel C, we normalize the loss at the necessity consumption basket weight (red vertical line) for the model with $\phi_\pi = 1.5, \phi_y = 0$, there we compare across models with different degree of response to the targeted inflation.

HANK model with household heterogeneity but no sector heterogeneity, show that a central bank that uses the same ad-hoc quadratic loss function that we use in this section can abstract from household heterogeneity to carry out its mandate. The key theoretical difference is that our model features both sectoral and household heterogeneity and, most importantly, their interaction: Hand-to-Mouth workers are more likely employed in the discretionary sector. This reasoning holds also in a simpler model without non-homotheticity but with sectoral heterogeneity, shown as purple dashed line: the result that the central bank should target discretionary inflation is dampened but still present. Only when we remove this crossing between sectoral and household heterogeneities, we go back to an irrelevance result: in a representative agent model it does not matter which inflation rate the central bank targets, irrespective of the presence of non-homotheticity in the utility function.

**Allowing for price stickiness heterogeneity.** Figure 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 this baseline exercise. 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 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.

Nevertheless, in panel B of Figure 8, contrast the results from a model with price stickiness heterogeneity with one with price stickiness heterogeneity. Indeed, we obtain the expected result that adding price stickiness heterogeneity (yellow dashed line) pushes to a even stronger case for the central bank to focus on discretionary inflation in the inflation index that enters the Taylor rule, compared to the homogenous price stickiness case (blue line).

**Which prices to stabilize vs. how strongly to stabilize them.** We established that targeting discretionary inflation improves welfare. However, a natural question that arises is how important this channel is quantitatively compared to other dimensions of choice that the central bank has in its policy rule. We achieve this by evaluating 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, $\phi_\pi$. The findings of this exercise are shown in panel C of Figure 8, which summarizes the welfare loss changes in the full model when $\phi_\pi$ is equal to 1.5 (blue line), 2 (red dashed line) or 3 (black dot-dashed 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 panel C of Figure 8, 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 anti-inflationary policies (from $\phi_\pi = 1.5$ to $\phi_\pi = 3$), targeting discretionary inflation reduces welfare losses. Moreover, the welfare loss of about 5% that results from shifting from targeting headline inflation (i.e. $\omega = \bar{C}^D$) to targeting discretionary inflation (i.e. $\omega = 1$), in the baseline model of $\phi_\pi = 1.5$ is similar in magnitude to a substantial more aggressive response to inflation, from $\phi_\pi = 1.5$ to 2 along the vertical red line. This implies that the choice of what sectoral inflation rate to target has a similar order of importance as how aggressively to target headline inflation.

It is worth noting that in our model, a more anti-inflationary 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 Figure 6. A more anti-inflationary 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 Figure E.1, 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.

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 B.3.2, 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, but robust to, 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.

# 6 Conclusions

This paper studies how the interaction between non-homothetic demand and sectoral labor-market heterogeneity shapes both the transmission and the design of monetary policy. We document a systematic asymmetry in the Euro-area: the ECB monetary policy primarily affects quantities in discretionary sectors and prices in necessity sectors, while discretionary industries employ a disproportionate share of hand-to-mouth workers. These patterns imply that the composition of demand and employment across sectors plays a central role in aggregate fluctuations.

We layout a tractable New-Keynesian model that captures these features and use it to characterize optimal policy. In contrast to the standard prescription that assigns weights to sectoral inflation proportional to expenditure shares, the optimal policy in our setting places greater emphasis on discretionary inflation. This result arises even in an environment with symmetric shocks and symmetric nominal rigidities, and is driven by the fact that discretionary sectors combine the most interest-sensitive demand with the strongest employment-driven amplification. As a consequence, stabilizing discretionary inflation improves overall macroeconomic stabilization.

Our findings suggest that sectoral heterogeneity matters for monetary policy not only because different prices behave differently, but because different sectors play distinct roles in the propagation of shocks. When fluctuations in demand and employment are concentrated in particular sectors, the relevant inflation measure for policy is no longer simply an aggregate index, but one that reflects where the economic adjustment actually takes place. This perspective provides a new rationale for departing from headline-inflation targeting and highlights the importance of incorporating sectoral structure into monetary policy analysis.

# References


Acharya, S., E. Challe, and K. Dogra (2023): "Optimal monetary policy according to HANK," *American Economic Review*, 113, 1741–1782.

Aguiar, M. and M. Bils (2015): "Has Consumption Inequality Mirrored Income Inequality?" *American Economic Review*, 105, 2725–56.

Albacete, N., P. Fessler, and A. Pekanov (2024): "The role of MPC heterogeneity for fiscal and monetary policy in the euro area," Tech. rep., Working Paper.

Allayioti, A., L. Górnicka, S. Holton, and C. M. Hernández (2024): "Monetary policy pass-through to consumer prices: Evidence from granular price data," .

Altavilla, C., L. Brugnolini, R. S. Gürkaynak, R. Motto, and G. Ragusa (2019): "Measuring euro area monetary policy," *Journal of Monetary Economics*, 108, 162–179.

Altavilla, C., M. Bussiere, J. Galí, Y. Gorodnichenko, R. S. Gürkaynak, and H. Rey (2024): "A research program on monetary policy for Europe," *Journal of Monetary Economics*, 147, 103673.

Andreolli, M., N. Rickard, and P. Surico (2024): "Non-Essential Business Cycles," Tech. rep., CEPR Discussion Paper No. 19773.

Andreolli, M. and P. Surico (2021): "LESS Is MORE: Consumer Spending and the Size of Economic Stimulus Payments," CEPR Discussion Paper.

Aoki, K. (2001): "Optimal monetary policy responses to relative-price changes," *Journal of monetary economics*, 48, 55–80.

Auclert, A., M. Rognlie, and L. Straub (2020): "Micro Jumps, Macro Humps: Monetary Policy and Business Cycles in an Estimated HANK Model," .

Bates, C., K. Bodnár, V. Botelho, and F. Rousseau (2025): "Real wage catch-up in the euro area," *Economic Bulletin Boxes*, 5.

Benigno, P. (2004): "Optimal monetary policy in a currency area," *Journal of international economics*, 63, 293–320.

Beraja, M. and C. K. Wolf (2021): "Demand composition and the strength of recoveries," Tech. rep., National Bureau of Economic Research.

Bilbiie, F. O. (2008): "Limited Asset Markets Participation, Monetary Policy and (Inverted) Aggregate Demand Logic," *Journal of economic theory*, 140, 162–196.

——— (2025): "Monetary policy and heterogeneity: An analytical framework," *Review of Economic Studies*, 92, 2398–2436.

Boehnert, L., S. de Ferra, K. Mitman, and F. Romei (2025): "Monetary Policy in Currency Unions with Unequal Countries," .

Browning, M. and T. F. Crossley (2000): "Luxuries Are Easier to Postpone: A Proof," *Journal of political Economy*, 108, 1022–1026.

Chow, G. C. and A.-l. Lin (1971): "Best linear unbiased interpolation, distribution, and extrapolation of time series by related series," *The review of Economics and Statistics*, 372–375.

Christiano, L. J., M. Trabandt, and K. Walentin (2010): "DSGE models for monetary policy analysis," in *Handbook of monetary economics*, Elsevier, vol. 3, 285–367.

Coibion, O. and Y. Gorodnichenko (2012): "What can survey forecasts tell us about information rigidities?" *Journal of political economy*, 120, 116–159.

Debortoli, D. and J. Galí (2024): "Idiosyncratic income risk and aggregate fluctuations," *American Economic Journal: Macroeconomics*, 16, 279–310.

Drescher, K., P. Fessler, and P. Lindner (2020): "Helicopter money in Europe: New evidence on the marginal propensity to consume across European households," *Economics Letters*, 195, 109416.

Galí, J. (2015): *Monetary policy, inflation, and the business cycle: an introduction to the new Keynesian framework and its applications*, Princeton University Press.

Gareis, J. and R. Minasian (2025): "Durability, essentiality, and the transmission of monetary policy to household consumption," .

Gautier, E., C. Conflitti, R. P. Faber, B. Fabo, L. Fadejeva, V. Jouvanceau, J.-O. Menz, T. Messner, P. Petroulas, P. Roldan-Blanco, et al. (2024): "New facts on consumer price rigidity in the euro area," *American Economic Journal: Macroeconomics*, 16, 386–431.

Guerrieri, V., G. Lorenzoni, L. Straub, and I. Werning (2021): "Monetary policy in times of structural reallocation," *University of Chicago, Becker Friedman Institute for Economics Working Paper*.

Hassan, T. A., S. Hollander, L. van Lent, and A. Tahoun (2019): "Firm-Level Political Risk: Measurement and Effects," *Quarterly Journal of Economics*, 134, 2135–2202.

Heathcote, J. and H. Tsujiyama (2021): "Optimal income taxation: Mirrlees meets Ramsey," *Journal of Political Economy*, 129, 3141–3184.

Jarociński, M. and P. Karadi (2020): "Deconstructing Monetary Policy Surprises—The Role of Information Shocks," *American Economic Journal: Macroeconomics*, 12, 1–43.

Jarociński, M. and B. Maćkowiak (2017): "Granger causal priority and choice of variables in vector autoregressions," *Review of Economics and Statistics*, 99, 319–329.

Kaplan, G., G. L. Violante, and J. Weidner (2014): "The wealthy hand-to-mouth," Tech. rep., National Bureau of Economic Research.

Mankiw, N. G. and R. Reis (2007): "Sticky information in general equilibrium," *Journal of the European Economic Association*, 5, 603–613.

McKay, A. and C. Wolf (2022): "Optimal policy rules in hank," *Manuscript, January*, 121–144.

Olivi, A., V. Sterk, and D. Xhani (2025): "Optimal Monetary Policy in a Cost-of-Living Crisis," Tech. rep., UCL and Tilburg University.

Slacalek, J., O. Tristani, and G. L. Violante (2020): "Household balance sheet channels of monetary policy: A back of the envelope calculation for the euro area," *Journal of Economic Dynamics and Control*, 115, 103879.

Smets, F. and R. Wouters (2003): "An estimated dynamic stochastic general equilibrium model of the euro area," *Journal of the European economic association*, 1, 1123–1175.

——— (2007): "Shocks and frictions in US business cycles: A Bayesian DSGE approach," *American economic review*, 97, 586–606.

Temursho, U. and M. Weitzel (2024): "Consumer demand in EU member states," *Publications Office of the European Union*.

Woodford, M. (2003a): "Interest and prices: Foundations of a theory of monetary policy," .

——— (2003b): "Optimal interest-rate smoothing," *The Review of Economic Studies*, 70, 861–886.

# Appendix

"Discretionary Inflation and Optimal Monetary Policy"

by Michele Andreolli (Boston College), Natalie Rickard (Bank of England), Paolo Surico (LBS) and Chiara Vergeat (LBS) [1]

[1]This appendix contains key supplementary material referenced in the main text. In addition to this, an Online Appendix contains further material and evidence for interested readers, available at: https://mandreolli.github.io/.

# A Measurement

This section provides full technical details of the data construction for the paper. 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 and document the share of hand-to-mouth workers across sectors using data from the ECB Household Finance and Consumption Survey (HFCS). We also construct category-specific stock price and dividend indices using data from Eikon, and derive novel series for gross value added, wages, and operating surplus in necessity and discretionary industries from national accounts data.

## A.1 Data Construction

### A.1.1 Necessity and discretionary spending in national statistics

We classify consumption categories into necessity and discretionary goods based on the classification developed by the UK Office for National Statistics (ONS), which closely aligns with the distinction between essential and non-essential goods proposed by Andreolli et al. (2024) and the Engel curve-based methodology of Aguiar and Bils (2015). The ONS classifies COICOP 4-digit consumption categories into necessity (non-discretionary) and discretionary goods. 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 A.1 displays in detail the classification of consumption categories.

Table A.1: Classification of Necessity and Discretionary Consumption Categories

| **COICOP 4-digits** |
| --- |
| **Necessity**<br>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 n.e.c.; 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 and secondary education excluding tertiary education; canteens; personal care products; childcare; insurance; deposit and loan facilities direct charges and other financial services; other services. |
| **Discretionary**<br>Cakes and biscuits; chocolate; confectionery; ice cream and other dairy products; waters, soft drinks and juices; spirits; wine; beer; tobacco; garments for men, women, infants and children; footwear for men, women, 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 4-digit consumption categories into necessity and discretionary consumption goods from the ONS.

### A.1.2 Classification of necessity and discretionary consumption categories

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, available at the 3-digit level, by assigning each 3-digit category according to the majority classification of its 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, although 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.

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, 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 A.2 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.

### A.1.3 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. 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

Table A.2: Classification of COICOP 3-digit Categories

| **COICOP 3-digits** |
|---|
| **Necessity**<br>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**<br>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-digit consumption categories into necessity and discretionary consumption goods, built from the ONS classification of COICOP 4-digit consumption categories.

procedure with 2015 as the reference year. More specifically, we first construct:

$$CP_{N,y} = \sum_{i \in N} cp_{i,y}, \qquad PYP_{N,y} = \sum_{i \in N} pyp_{i,y}$$

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:

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

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-digit category based on the share of necessity and discretionary consumption within each category in the annual series for Italy and Germany, using average shares over the sample period 1995–2022. 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 A.3 details the final classification of COICOP 2 digits categories into necessity and discretionary.

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 âEducationâ 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 expendi-

Table A.3: Classification of COICOP 2-digit Categories

| **COICOP 2-digits** |
|---|
| **Necessity**<br>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**<br>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 2-digit consumption categories into necessity and discretionary consumption goods, built from our classification of COICOP 3-digit categories and expenditure shares in necessity and discretionary goods computed using Eurostat annual consumption data.

ture 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 Price 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:

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

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

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

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:

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

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

### A.1.4 NLAnalytics

NLAnalytics applies natural language processing (NLP) to the full text of publicly available earnings call transcripts, following the methodology of Hassan et al. (2019). For each call, it identifies sentences that contain a predefined set of search terms associated with a given topic, and classifies each matching sentence as positive, negative, risk-related, or merely exposing the topic. We use data covering the period from January 2002 to December 2025. We restrict the sample to firms whose headquarters are located in one of the twenty euro-area member states: Austria, Belgium, Croatia, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, and Spain.

For each topic and each earnings call, we obtain four raw counts: the number of positive sentences ($P$), negative sentences ($N$), risk-related sentences, and total sentences ($S$). Firm-level counts are aggregated to the quarterly level by summing across all calls within the quarter. The topic-specific sentiment index is then defined as:

$$\text{Sentiment}_t = \frac{\sum_i P_{i,t} - \sum_i N_{i,t}}{\sum_i S_{i,t}}$$

where the sums run over all firm-quarter observations in the euro-area sample.

To smooth out within-year reporting seasonality arising from staggered reporting dates across jurisdictions, we apply a two-quarter backward-looking moving average to each index. All indices are subsequently standardised—demeaned and scaled by their standard deviation—before plotting. The sample displayed in Figure 3 starts in 2003Q1 to allow for the initialisation of the moving average. Recession shading is based on EABCN recession dates.

To measure sentiment for each topic, each topic index is constructed from a keyword query submitted to NLAnalytics. Table A.4 reports the exact query used for the three topic series plotted in Figure 3. The discretionary query covers spending categories that map to our discretionary consumption classification. The housing query focuses on the residential real estate and mortgage market. The energy query covers fossil fuels, electricity and utilities, and the renewable-energy transition.

Table A.4: NLAnalytics Keyword Queries

| **Topic** | **Query used in NLAnalytics** |
|---|---|
| **Discretionary** | (“restaurant prices” OR “restaurant sales” OR restaurants OR cafes OR cafés OR dining OR “dining out” OR foodservice OR “food away from home” OR catering OR canteens) OR (“alcohol prices” OR alcohol OR spirits OR liquor OR wine OR beer OR breweries OR distilleries OR tobacco OR cigarettes OR cigars OR vaping OR nicotine OR cannabis OR narcotics) OR (“clothing prices” OR “apparel prices” OR clothing OR apparel OR garments OR fashion OR footwear OR shoes OR sneakers OR boots OR tailoring OR “clothing repair”) OR (“furniture sales” OR furniture OR furnishings OR carpets OR flooring OR rugs OR bedding OR curtains) OR (“consumer appliances” OR appliances OR “white goods” OR refrigerator OR washing machine OR dishwasher OR microwave OR cookware OR utensils OR hardware OR tools OR “household durables”) OR (“vehicle sales” OR automobiles OR cars OR motorcycles OR bicycles OR bikes) OR (“air travel” OR airlines OR flights OR airfare OR aviation) OR (“water transport” OR ferries OR cruises OR cruise lines) OR (“transport services” OR mobility services OR ride-hailing OR rideshare) OR (“consumer electronics” OR electronics OR televisions OR TVs OR cameras OR photography OR optical equipment OR computers OR laptops OR tablets OR gaming consoles OR “device repair”) OR (“recreational equipment” OR sports equipment OR camping OR outdoor equipment OR musical instruments OR toys OR games OR hobbies OR gardening OR plants OR flowers) OR (“recreation services” OR entertainment OR leisure OR gyms OR fitness OR sporting services OR cultural services OR concerts OR theaters OR museums OR gambling OR casinos OR lotteries) OR (“books” OR publishing OR newspapers OR magazines OR periodicals OR stationery OR office supplies) OR (“package holidays” OR tourism OR travel packages OR leisure travel) OR (“tertiary education” OR university OR college OR higher education OR private education) OR (“hotel prices” OR hotels OR accommodation OR lodging OR hospitality) OR (“personal grooming” OR hairdressing OR salons OR barbers OR beauty services OR cosmetics) OR (jewellery OR jewelry OR watches OR clocks OR accessories OR personal effects) |
| **Housing** | housing OR residential OR single-family OR houses OR multifamily OR “new construction” OR “home prices” OR mortgage |
| **Energy** | (energy OR “energy markets” OR “energy prices” OR “energy costs” OR “energy demand” OR “energy supply”) OR (oil OR “crude oil” OR Brent OR WTI OR “oil prices” OR “oil market” OR “oil production” OR “oil supply” OR OPEC OR “OPEC+” OR shale OR “shale oil”) OR (“natural gas” OR gas OR “natural gas prices” OR “gas prices” OR “gas supply” OR LNG OR “liquefied natural gas”) OR (fuel OR fuels OR gasoline OR petrol OR diesel OR “jet fuel” OR “fuel prices” OR “fuel costs” OR refining OR refineries) OR (electricity OR power OR “power prices” OR “electricity prices” OR utilities OR generation OR grid OR transmission) OR (renewables OR renewable OR solar OR wind OR “clean energy” OR “energy transition”) |

*Notes:* The table reports the exact Boolean queries submitted to NLAnalytics to generate the three topic-specific sentiment series in Figure 3. All queries cover the period 2002–2025.

### A.1.5 Classification of Industries

To extend the necessity-discretionary framework beyond consumption and prices to the supply side, we classify industries according to the nature of the goods and services they produce. We follow the methodology developed in Andreolli et al. (2024) for the US, adapting it here to the Euro Area context. 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. 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 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 according to the downstream final goods industries that they primarily supply. This follows the same procedure as in Andreolli et al. (2024), which the reader can refer to for a more detailed explanation. We start from the input-output table, considering only the input-output linkages of 62 NACE Rev. 2 2-digit industries both as suppliers and buyers of intermediate goods. We modify the original table to account for 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-output matrix into necessity and discretionary portions based on this expenditure share. This assumes that input industries supplying retail trade do not differentially serve necessity and discretionary retail activity—a simplification, 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 it sells more to necessity final goods industries than to discretionary ones, and if the combined necessity and discretionary sales account for at least one-third of the industry's total sales. 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 A.5 displays our final classification of industries in detail.

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, note that the mapping here has less strenuous requirements than an exact mapping of NACE Rev. 1 to Rev. 2; we only seek to ensure that the necessity vs discretionary classification is consistent over time, not that each matched industry is identical. 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 A.5: Classification of Industries into Necessity and Discretionary

**NACE Rev. 2 - 2-digit 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.

Table A.6: Classification of Industries into Necessity and Discretionary

**NACE Rev. 1 - 2-digit 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 organizations 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-digit industries with corresponding NACE Rev. 1 2-digit industries, and then applying our classification of necessity, discretionary, and unclassified industries.

### A.1.6 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 classified according to NACE Rev. 1, 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 classified according to NACE Rev. 2.

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.

### A.1.7 Share of Hand-to-Mouth Workers in Necessity and Discretionary Industries

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. We follow the methodology of Slacalek et al. (2020) and Kaplan et al. (2014), using 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. Formally, a household is considered as hand-to-mouth if:

- Net Liquid Wealth $\geq 0$ AND Net Liquid Wealth $\leq$ biweekly income OR
- Net Liquid Wealth $< 0$ AND Net Liquid Wealth $\leq$ 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. Results are similar if instead NACE 1-digit categories are allocated proportionally across groups based on employment shares. This mapping is an approximation, but one that would likely only mute the heterogeneity we find relative to a setting in which 2-digit industry detail were directly available in the HFCS. 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.

### A.1.8 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 Bates et al. (2025) for negotiated 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 Espana and the Spanish Ministry of Labour and Social Economy, the Banca dâItalia 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. [2]

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

### A.1.9 Stock Prices and Dividends

To analyse equity market dynamics across necessity and discretionary sectors, we construct stock price and total dividends indices using firm-level 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:

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

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, ormergers), 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:

$$D_{t+1}^N = D_t^N \times \frac{M_{t+1}^N}{M_t^N}$$

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. 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. All dividend values are expressed in real terms, deflated using the Harmonised Index of Consumer Prices (HICP).

### A.1.10 National Accounts Data

To understand the broader implications of necessity and discretionary dynamics across firms and industries, we construct novel series of Gross Value Added, Compensation of Employees, Wages and Salaries, and Operating Surplus for the two sectors, building from disaggregated industry figures. We combine our industry classification with detailed industry data from the national accounts, interpolating using more aggregated sectoral quarterly data. The annual data are available until 2022, after which we extrapolate using the quarterly data. Specifically, the series are constructed from 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 nececessity 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.

#### A.1.11 Calculations behind the recession plots, and recession plots for price indices and stock prices.

This section provides the detailed methodology underlying the third column in Figure 1 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 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.

## A.2 Measurement of alternative consumption categorisations

**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 A.7 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 A.7: Classification of COICOP 3-digit Categories into Six-Way Split

| | **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; other services n.e.c.; package holidays; education; accommodation services. |

*Notes:* The table reports the classification of COICOP 3-digit consumption categories into necessity durables, necessity non-durables, necessity services, discretionary durables, discretionary non-durables, and discretionary services.

**Tradables and non-Tradables and four ways split** In Table B.2 of the main text, we report average expenditure shares across four consumption categories: tradable necessity goods, tradable discretionary goods, non-tradable necessity goods and non-tradable discretionary goods. These categories are constructed by combining our own classification of goods into necessity and discretionary categories with the tradable/non-tradable classification of 3-digit COICOP consumption items provided by Boehnert et al. (2025). The mapping of 3-digit COICOP categories into these four broad consumption groups-tradable necessities, tradable discretionary goods, non-tradable necessities, and non-tradable discretionary goods-is presented in Table A.8.

Table A.8: Classification of COICOP 3-digit Categories into Four-Way Split

| | **Tradables** | **Non-Tradables** |
|---|---|---|
| **Necessity** | Telephone and telefax equipment; medical products, appliances and equipment; food; electricity, gas and other fuels. | Water supply and miscellaneous services relating to the dwelling; financial services n.e.c.; social protection; hospital services; maintenance and repair of the dwelling; out-patient services; postal services; insurance; actual rentals for housing; imputed rentals for housing; telephone and telefax services; personal care; operation of personal transport equipment. |
| **Discretionary** | Purchase of vehicles; tobacco; goods and services for routine household maintenance; audio-visual, photographic and information processing equipment; clothing; household appliances; glassware, tableware and household utensils; newspapers, books and stationery; tools and equipment for house and garden; other major durables for recreation and culture; furniture and furnishings; carpets and other floor coverings; other recreational items and equipment; gardens and pets; narcotics; alcoholic beverages; footwear; non-alcoholic beverages; household textiles; package holidays. | Recreational and cultural services; education; accommodation services; catering services; transport services; personal effects n.e.c.; prostitution; other services n.e.c. |

*Notes:* The table reports the classification of COICOP 3-digit consumption categories into necessity tradables, necessity non-tradables, discretionary tradables, and discretionary non-tradables.

# B Further descriptive evidence

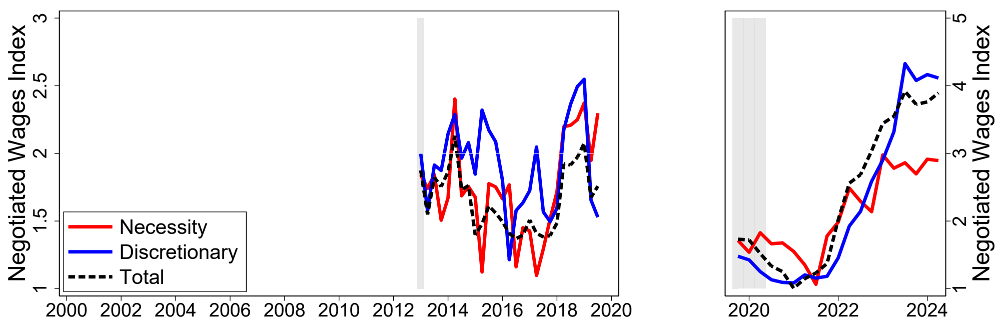
This section provides additional descriptive evidence on the behavior of necessity and discretionary sectors across several macroeconomic dimensions and over Euro Area business cycles. It also examines their leading indicator properties and presents descriptive evidence on how our necessity-discretionary classification relates to alternative consumption classifications.

## B.1 Additional Time Series Evidence

This section provides time-series evidence on the behavior of necessity and discretionary sectors across several macroeconomic dimensions, complementing the evidence on consumption, prices, and employment presented in Section 2.

Figure B.1 shows the evolution of negotiated wages in aggregate and split into necessity and discretionary industries. The time series are reported in growth rates. It is noteworthy that negotiated wage indices show no clear differences in cyclical patterns between necessity and discretionary industries, suggesting similar dynamics in wage-setting behaviour and nominal rigidity -a conjecture we explicitly verify in Section 2, where we find no differences in wage stickiness between the two sectors.

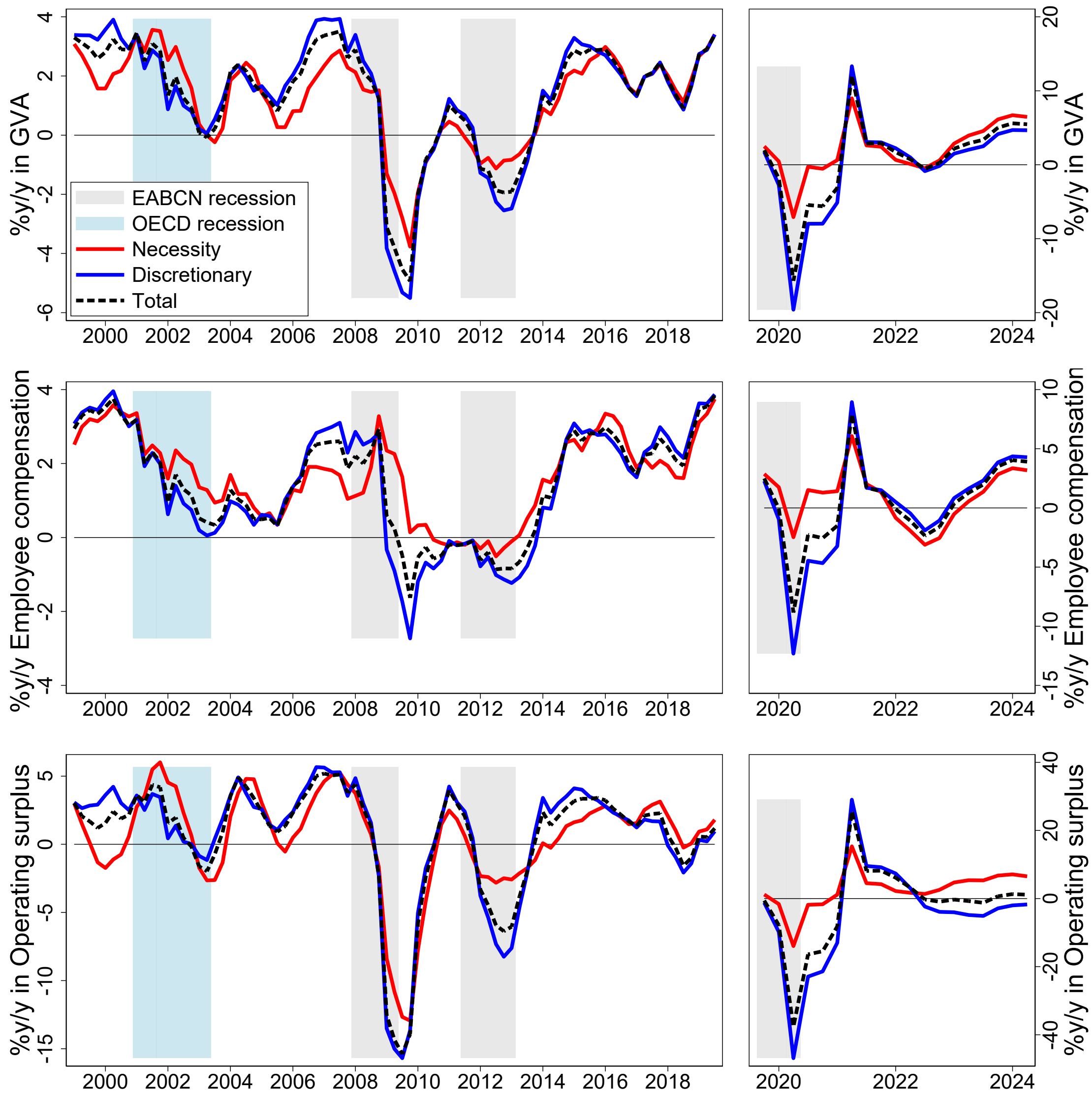
Figure B.1: Negotiated Wages Index




*Notes:* The table presents negotiated wages, both in aggregate and disaggregated into necessity and discretionary goods and industries. Data derived from the ECB wage tracker.

Figure B.2 shows the evolution of negotiated wages in aggregate and split into necessity and discretionary industries. The time series are reported in growth rates. 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. A possible interpretation of this finding is that there might exists significant differences in mark-up trends across sectors during periods of substantial inflation.

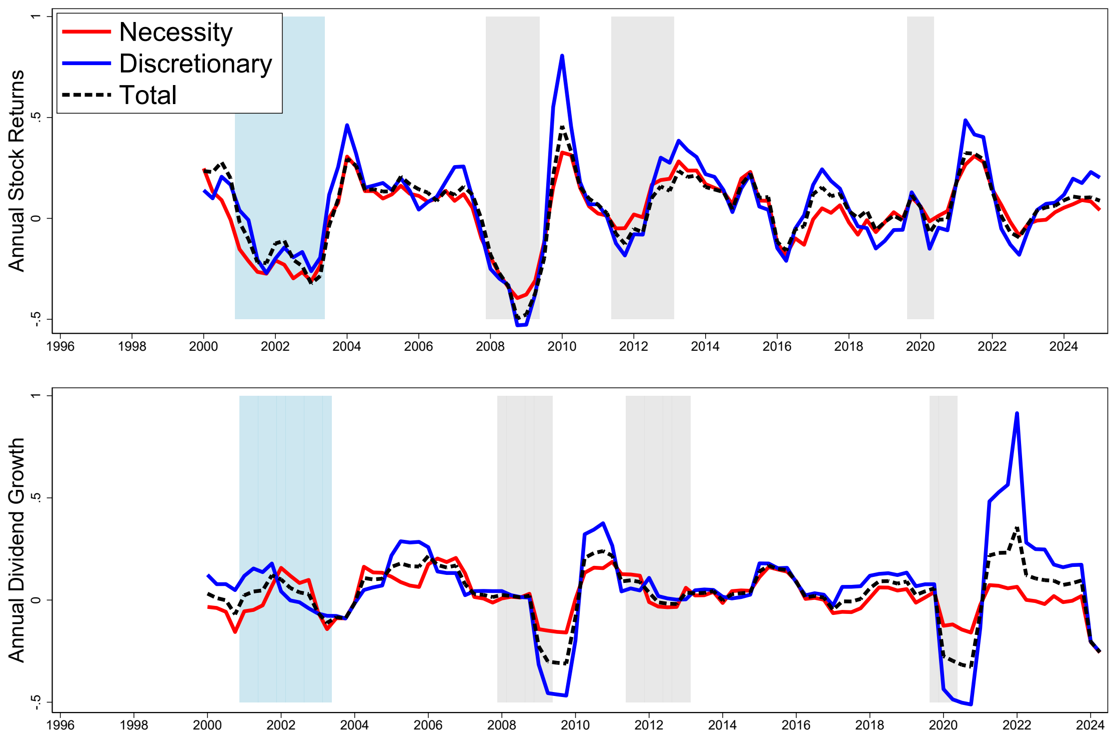
Figure B.2: National Accounts




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

In the top panel of B.3, we present 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 B.3 presents annual dividend growth in necessity and discretionary industries, and aggregate annual dividend growth. Consistent with the patterns 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.

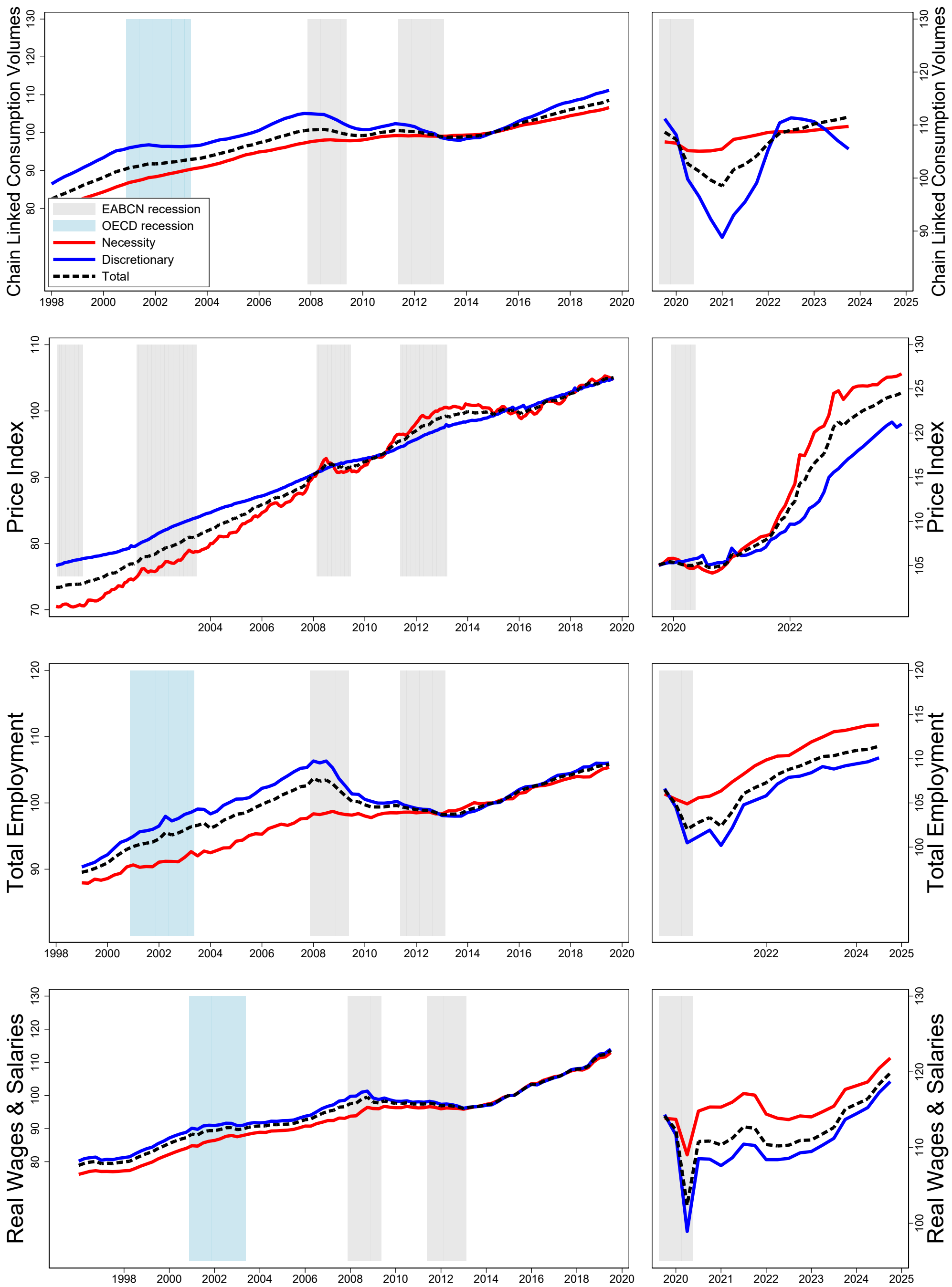
Figure B.3: Annual Stock Returns & Dividends Growth Rates in Necessity and Discretionary Industries




*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.

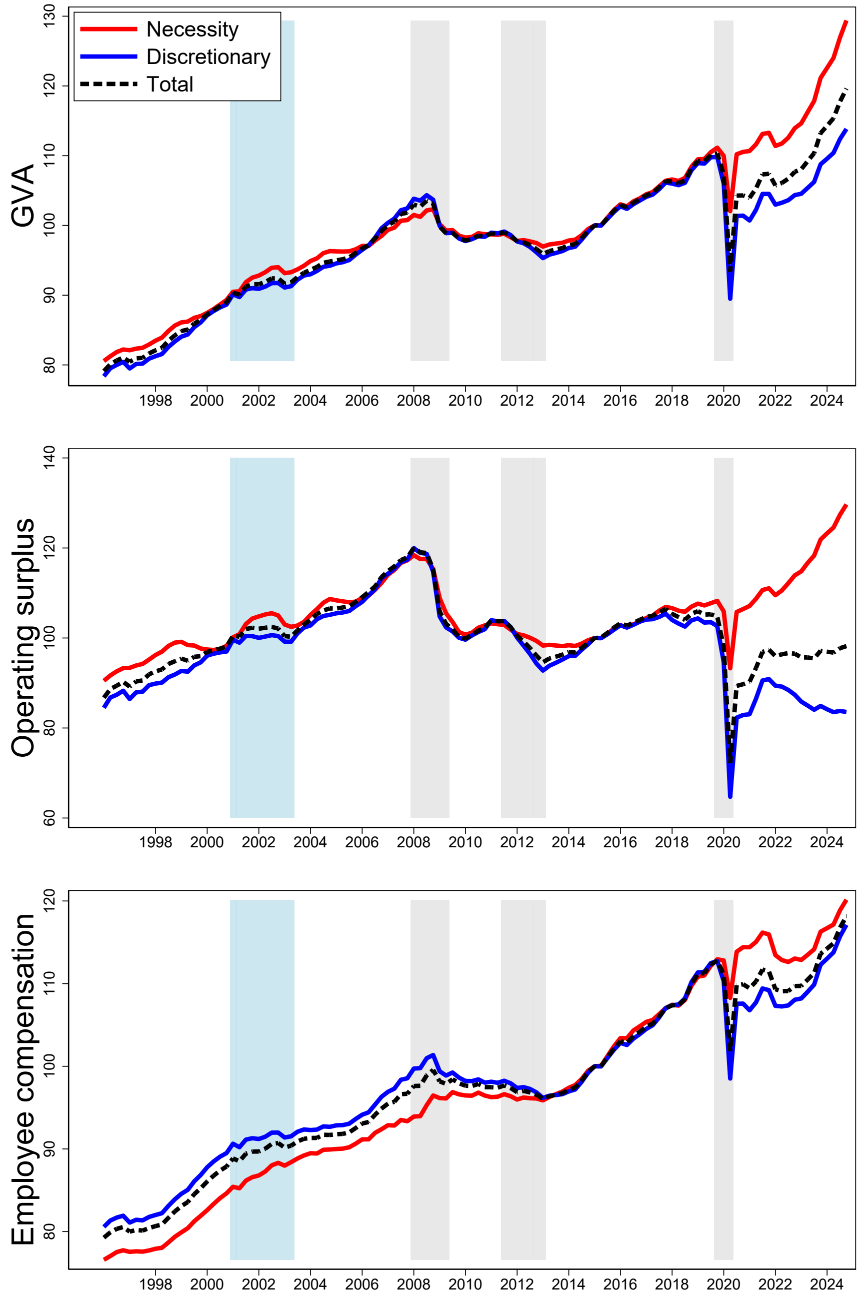
In Figure B.4, we plot indices for consumption, prices, employment, and wages and salaries, rather than the annual growth rates. One complication is that, for consumption, we only have quarterly growth rates available, as we interpolate annual Euro Area data from Eurostat using quarterly growth rates 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 Figure B.5 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 Figure B.2.

Figure B.4: Consumption, Prices, Employment and Wages - Indices




*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 Data Appendix for details on data construction.

Figure B.5: GVA, Operating Surplus, Compensation of Employees - Indices




*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.

## B.2 Leading Indicator Analysis

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 they use. We estimate this on a quarterly sample 1999-2019; whenever the time series of discretionary and necessity categories or industries are not sufficiently long, we extend these series back using the aggregated series so as to be able to employ 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.

Table B.1: Leading indicator properties of necessity and discretionary variables

| | *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 |

*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.

## B.3 Descriptive Statistics of alternative consumption categorizations

In Table B.2, we highlight 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 16.3%) and non-durables (about 8.2%) are also discretionary. Taken together, discretionary expenditures account for almost half (42.7%) of the Euro-area consumption basket. In Figure B.6 in Appendix B.3, 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 goodsâan 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.

In Table B.2, we further show that the necessity-discretionary classification is also distinct from the tradable-non-tradable classification. On average, between 1996 and 2024 in the Euro Area, discretionary consumption accounted for approximately 60% of expenditure on tradable goods and only around 30% of expenditure on non-tradable goods.

Table B.2: Composition of expenditure by category â shares (%)

*Panel (a): Non-durables, services, and durables & semi-durables*

| | Goods and services | | | Share of total |
|---|---|---|---|---|
| **Sectors** | Non-durables | Services | Durables | (%) |
| Euro area | 32.7 | 48.8 | 18.5 | 100.0 |
| Necessity | 24.5 | 32.5 | 0.3 | 57.3 |
| Discretionary | 8.2 | 16.3 | 18.2 | 42.7 |

*Panel (b): Tradables and non-tradables*

| | Goods and services | | Share of total |
|---|---|---|---|
| **Sectors** | Tradable | Non-tradables | (%) |
| Euro area | 43.2 | 55.8 | 100.0 |
| Necessity | 17.7 | 39.6 | 57.3 |
| Discretionary | 26.5 | 16.2 | 42.7 |

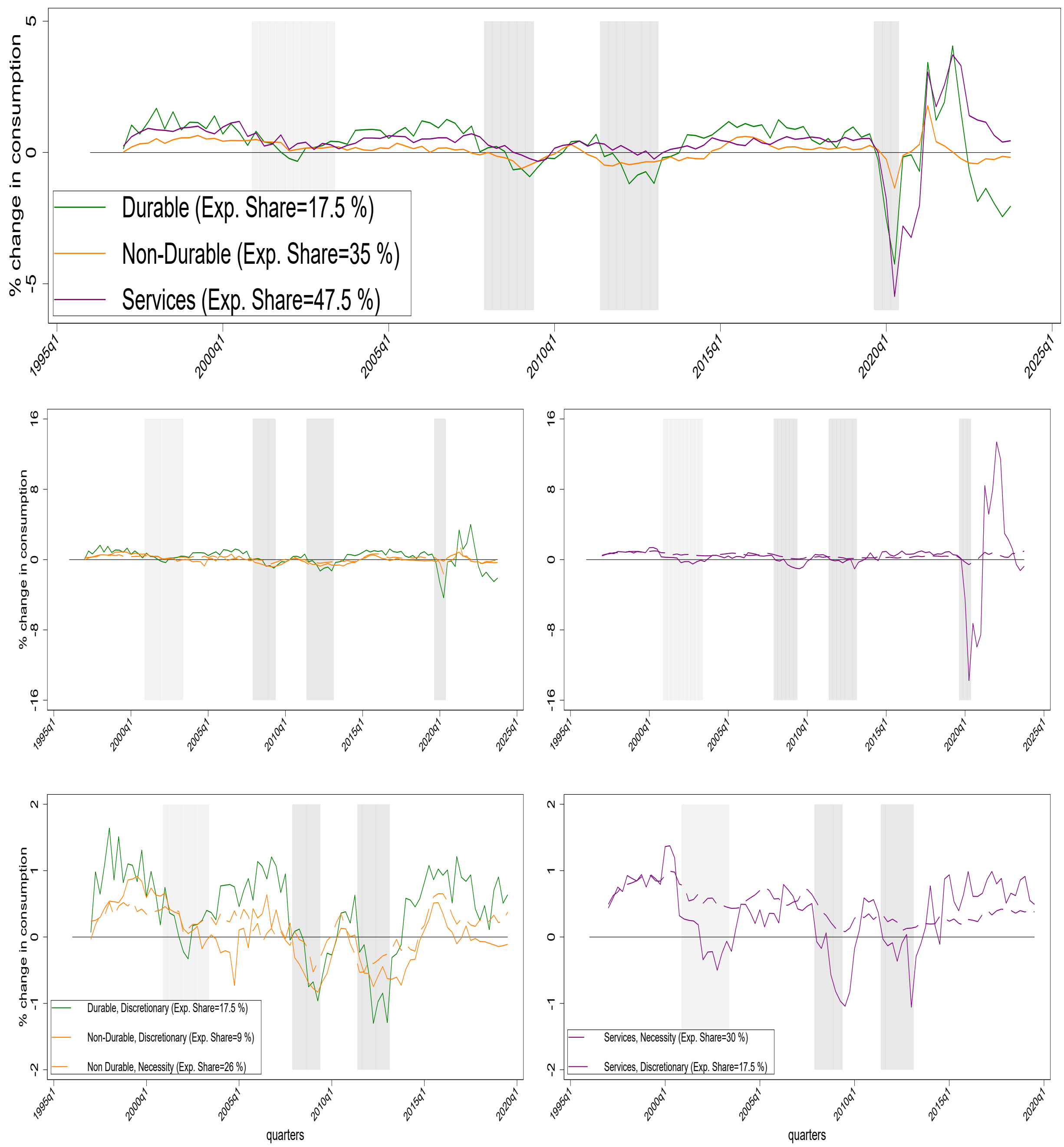
*Note:* Values are average expenditure shares in the Euro Area. Panel (a) disaggregates into durables (including semi-durables), non-durables, and services, and then into necessity and discretionary categories within each group. Panel (b) disaggregates into tradables and non-tradables, and then into necessity and discretionary categories within each group. Derived from Eurostat Household Budget Survey.

### B.3.1 Non-durables, services and durables

In Figure B.6, 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.

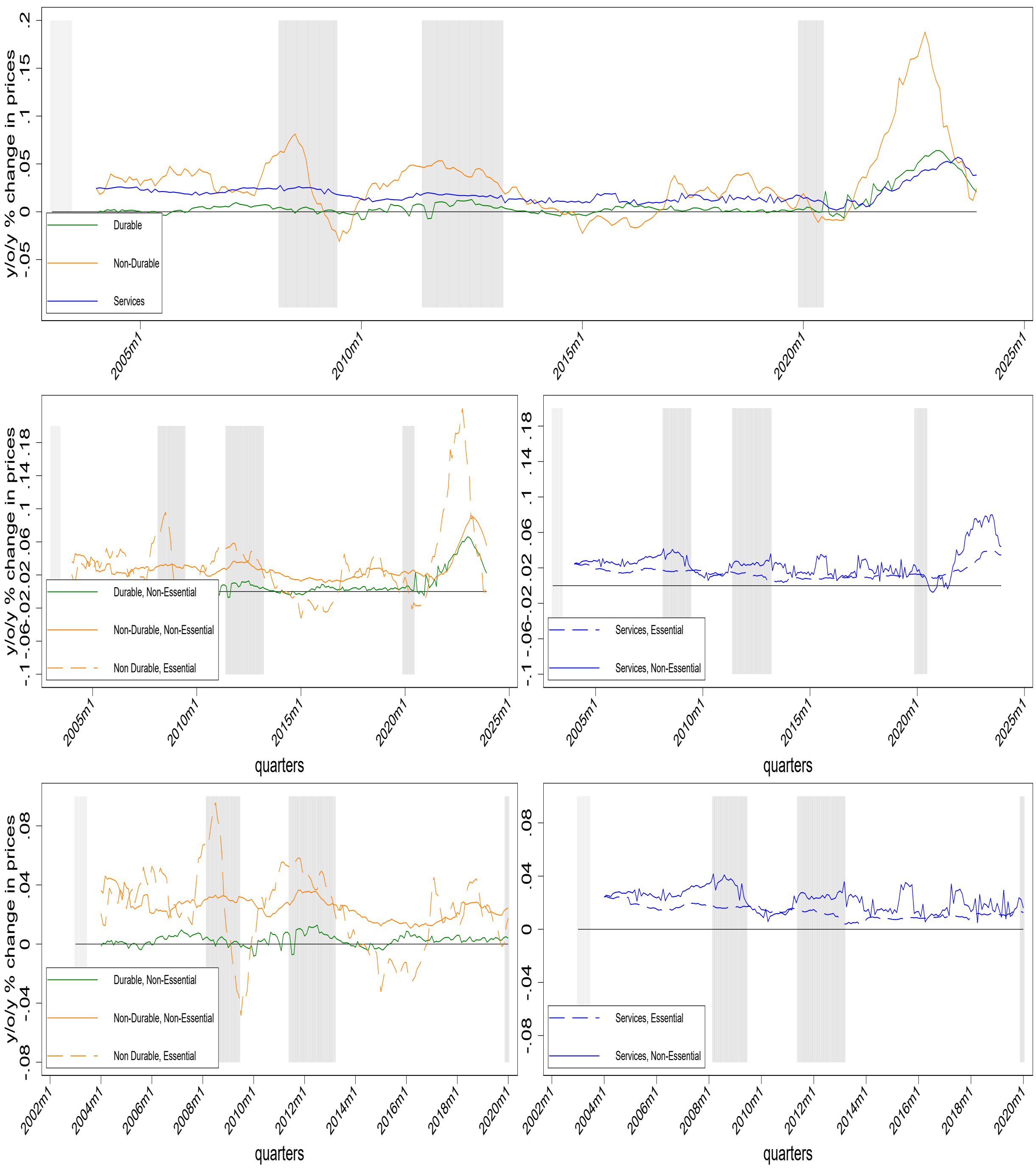
In Figure B.7, we plot annual growth rates for HICP-like price indices of durable goods, non-durable goods, and services in the top panel. The middle and bottom panels present annual growth rates for necessity and discretionary goods separately within these durability categories. As before, the middle 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.

Figure B.6: Durable, non-Durable and Services Consumption - Aggregate & Necessity/Discretionary Split




*Notes:* The top panel shows the evolution over time of durable, non durable and services consumption in the EA from 1997Q1 to 2024Q2, the middle panel rapresents the evolution over time of the same series, split into necessity and discretionary, and the bottom panel shows the same series, zooming in the pre-Covid period.

Figure B.7: Durable, non-Durable and Services Prices - Aggregate & Necessity/Discretionary Split



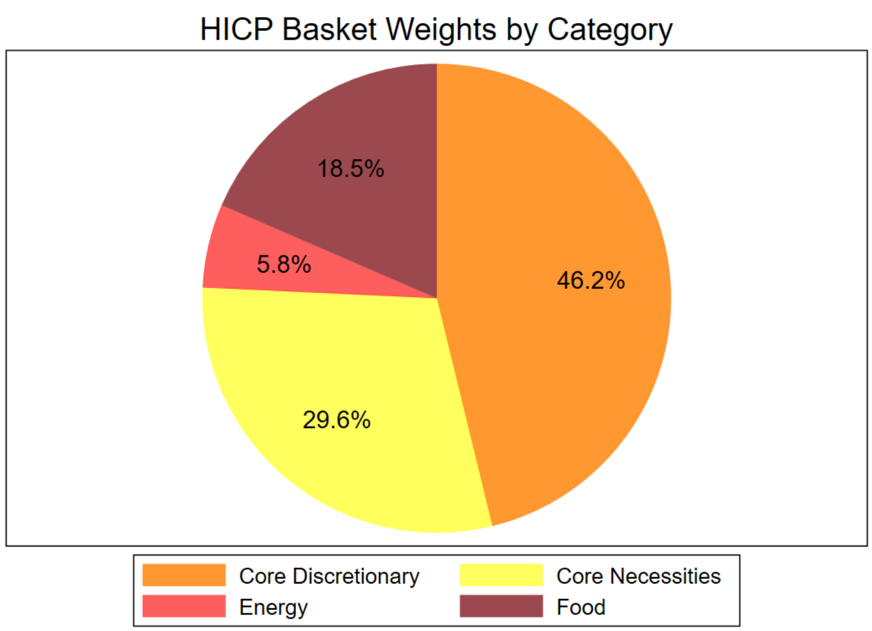

*Notes:* The top panel shows the evolution over time of durable, non durable and services prices in the EA from 2003Q1 to 2024Q2, the middle panel rapresents the evolution over time of the same series, split into necessity and discretionary, and the bottom panel shows the same series, zooming in the pre-Covid period.

### B.3.2 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. Figure B.8 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.

Figure B.8: HICP Basket Weights of Energy, Food, Core Necessities and Core Discretionaries

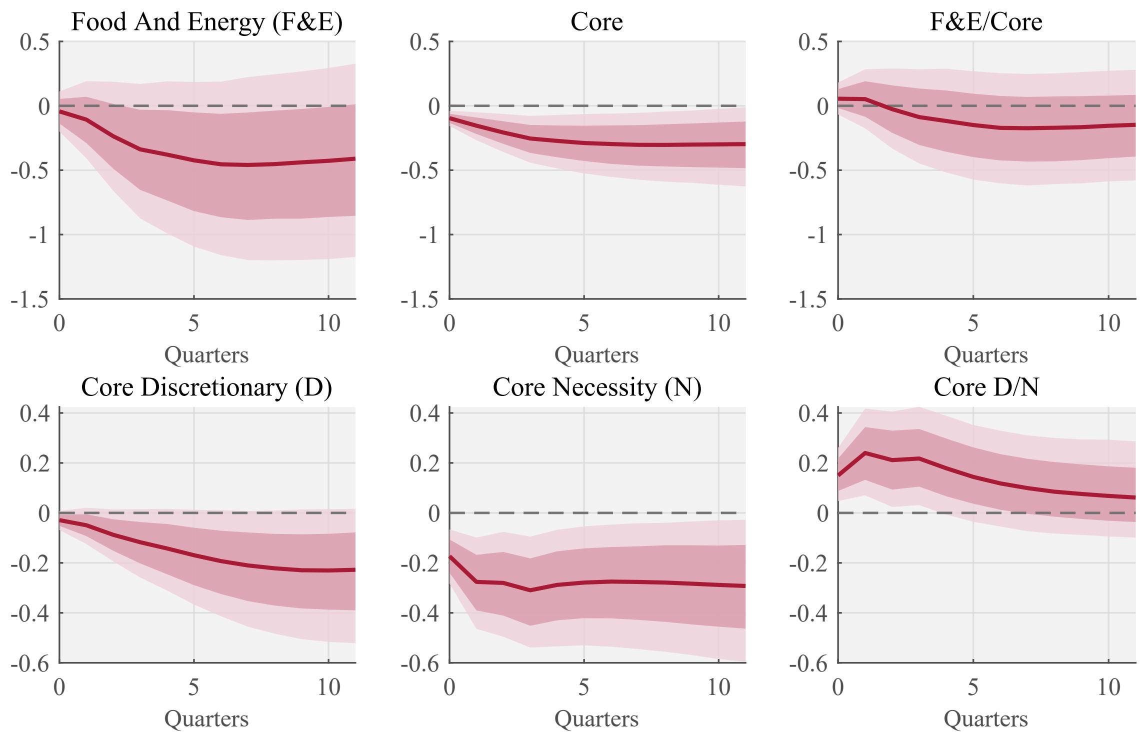



*Notes:*The figure displays the HICP weights of energy, food, core necessity and core discretionary consumption goods. Energy corresponds to the COICOP 3 digits code CP045, food corresponds to the COICOP 3 digits codes CP011  CP012. The rest of the COICOP codes are split into core-necessity and core-discretionary 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. Figure B.10 reports the IRFs estimated over the full sample period (1999Q1-2024Q2), while Figure **??** 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. behave differently.

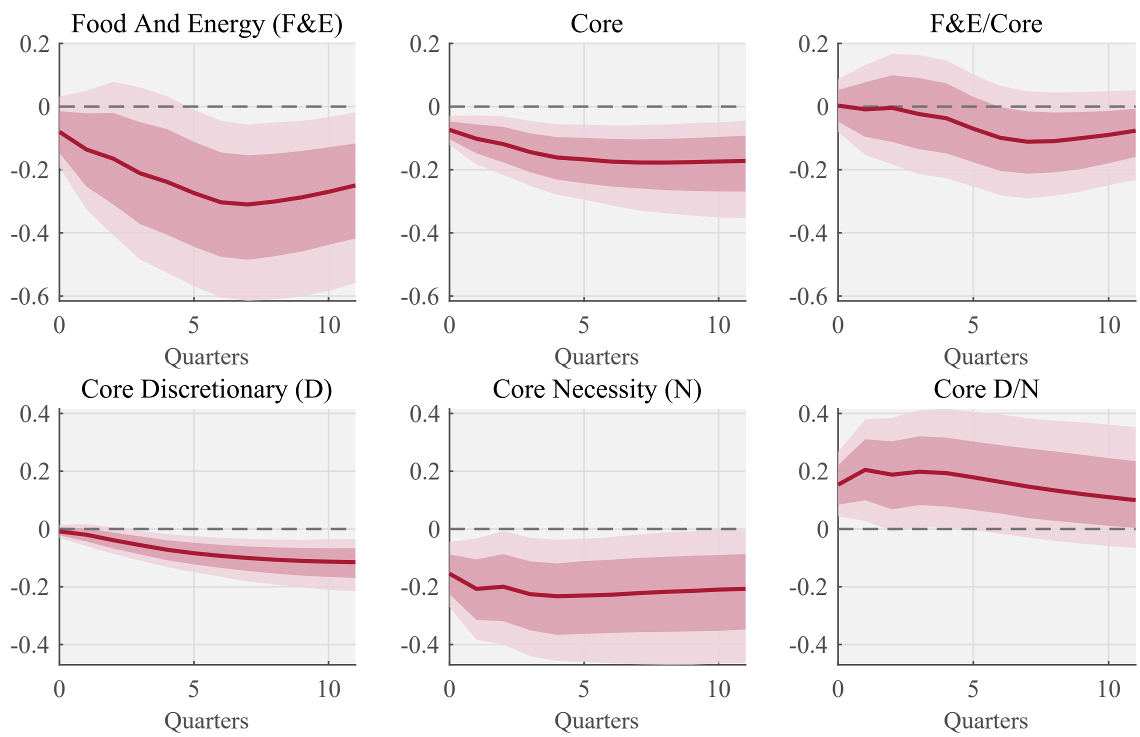
Our findings contrast with those reported by Allayioti et al. (2024), who find that discretionary item prices respond more strongly to monetary policy shocks. However, our methodology differs substantially from theirs. Specifically, we first aggregate the prices of necessity and discretionary goods into 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 focuses on the sensitivity of price responses rather than consumption cyclicality - the resulting series

Figure B.9: Impulse response functions - Prices, full sample.




*Notes:* The figure displays the IRFs to identified monetary policy shocks of Food and Energy (log) Prices, Core (log) Prices, the (log) difference between food and energy and core prices, (log) core necessity and(log) core discretionary, and the log difference between core discretionary and core necessity prices. 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. Price indices for the various sub-categories are constructed following the methodology used to construct necessity and discretionary prices indices, outlined in the Data section of the appendix. The IRFs are estimated using the *poor man* identification on the whole sample period (1999Q1, 2024Q2).

Figure B.10: Impulse response functions - Prices, pre-Covid sample.



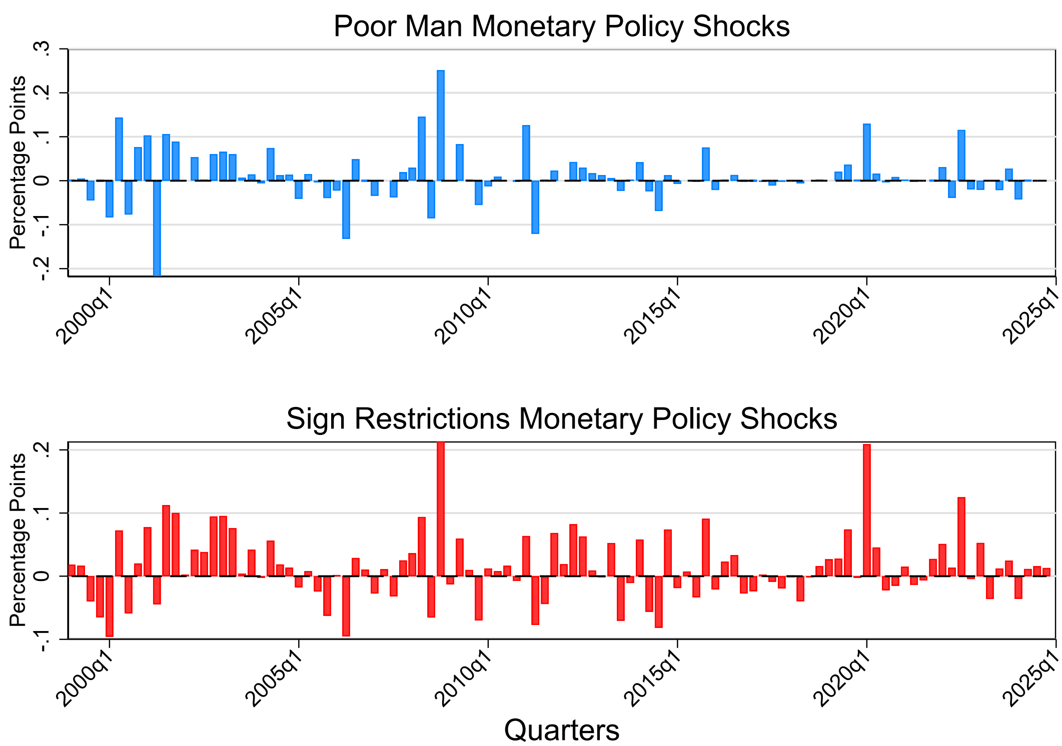

*Notes:* The figure displays the IRFs to identified monetary policy shocks of Food and Energy (log) Prices, Core (log) Prices, the (log) difference between food and energy and core prices, (log) core necessity and(log) core discretionary, and the log difference between core discretionary and core necessity prices. 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. Price indices for the various sub-categories are constructed following the methodology used to construct necessity and discretionary prices indices, outlined in the Data section of the appendix. The IRFs are estimated using the *poor man* identification on the pre-Covid sample period (1999Q1, 2019Q4).

# C Monetary Policy Shocks, IRFs of baseline proxy-VAR and IRFs obtained with alternative specifications.

## C.1 Monetary Policy Shocks

Figure C.1 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 Jarociński and Karadi (2020) within each quarter in our sample.

Figure C.1: Sign Restriction and Poor Man Monetary Policy Shocks from Jarociński and Karadi (2020).

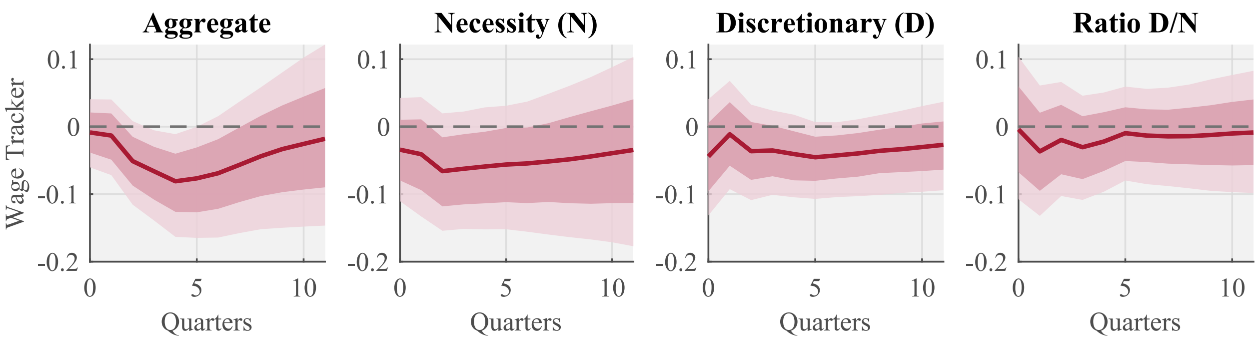



## C.2 IRFs of Additional Variables

In this section, we show impulse response functions to monetary policy shocks of additional necessity and discretionary variables. These are estimated using our baseline specification outlined in section 3. Figure C.2 reports the responses of the ECB Wage Tracker index at the aggregate level, as well as for necessity and discretionary sectors and the discretionary-to-necessity ratio. Figure C.3 shows the corresponding responses for stock prices and dividends. Finally, Figure C.4 presents the responses of national accounts variables, again for aggregate, necessity, discretionary series, and their ratio. We note that the sample period used differs for the ECB wage tracker, where due to shorter data availability the BVAR is estimated on a sample starting in 2013q1.

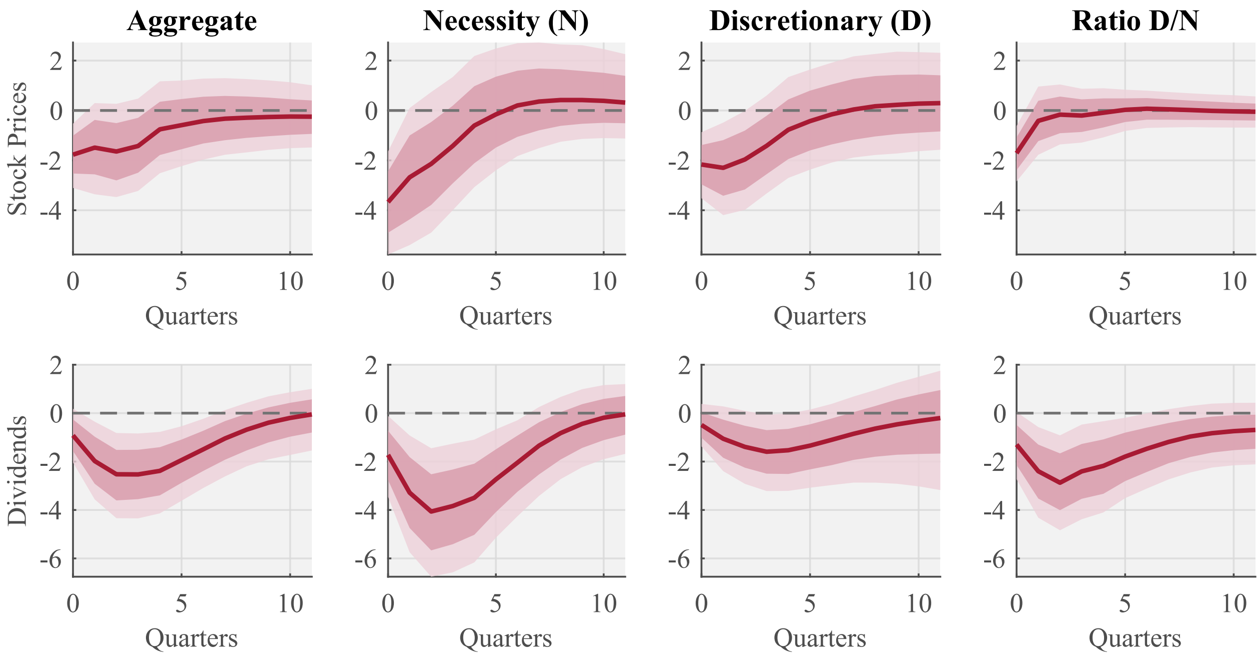
Following a monetary policy shock, discretionary stock prices, dividends paid by firms in discretionary industries and gross value added in discretionary industries respond twice as much as their necessity counterparts. Compensation of employees and operating surplus decline and the fall in discretionary 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 reflects the impacts of the different discretionary and necessity price and consumption dynamics. As shown in Figure 4, 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.

Figure C.2: Estimated IRFs to a contractionary monetary policy shock - ECB Wage Tracker



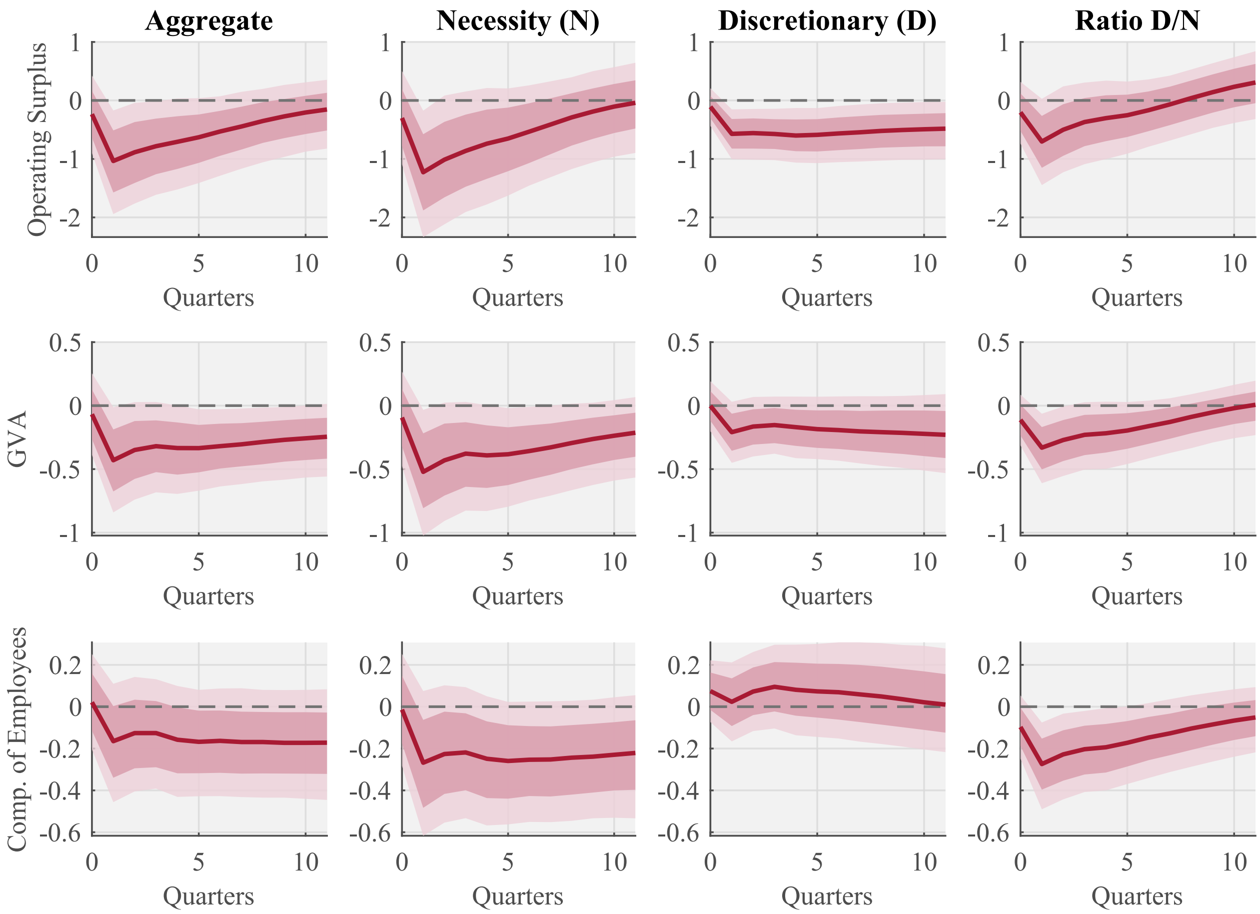

*Notes:* IRFs in response to a one standard deviation monetary policy shock, estimated using a BVAR on a quarterly sample 1999-2024q2. Median (line), percentiles 16-84 (darker band), percentiles 5-95 (lighter band). Quarters on the horizontal axes. Each IRF corresponds to a separate BVAR estimate with 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.

Figure C.3: Estimated IRFs to a contractionary monetary policy shock - Financial variables




*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.

Figure C.4: Estimated IRFs to a contractionary monetary policy shock - National Accounts variables




*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.

## C.3 Sign Restriction Identification

For robustness, we also estimate an alternative version of the BVAR using the sign-restriction identification approach proposed by Jarociński and Karadi (2020). 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-Ramirez, Waggoner, and Zha (2010). We compute sign restriction quarterly shocks, to match the frequency of the rest of our macroeconomic variables, by cumulating monthly shocks taken directly from Jarociński and Karadi (2020) within each quarter.

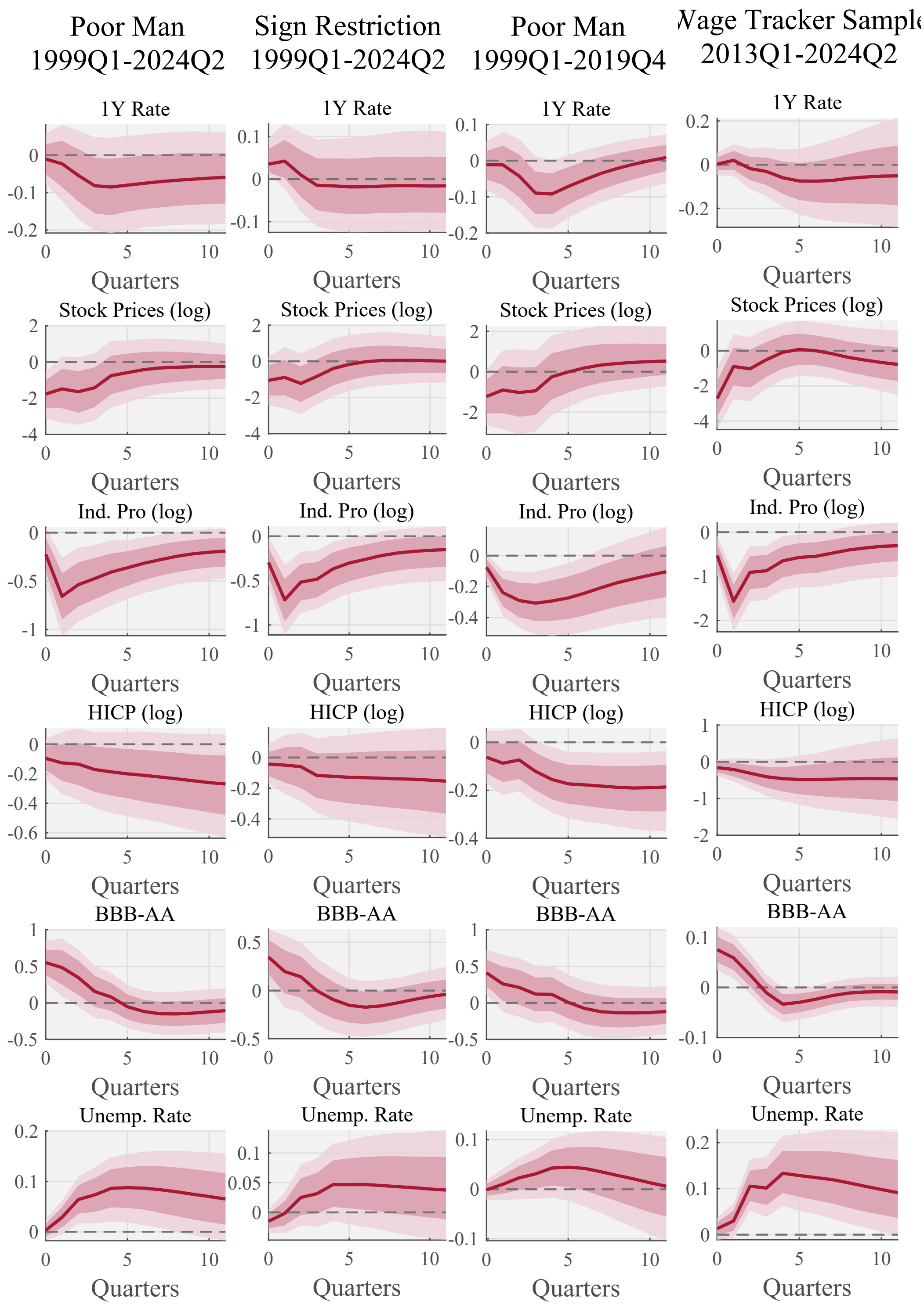
## C.4 IRFs of baseline proxy-VAR and IRFs obtained with alternative specifications.

Across all specifications, we control for a set of baseline variables following Jarociński and Karadi (2020): The 1 year Bund Yield, the BBB-AA corporate bond spread, the (log) real GDP, the (log) Stock Price Index, the (log) HICP. Compared to their specification, we also add the Unemployment Rate. Figure C.5 presents the impulse response functions 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. Column 2 displays the IRFs from an alternative specification estimated on the same full sample, but using the sign restrictions identification approach. 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 by 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.

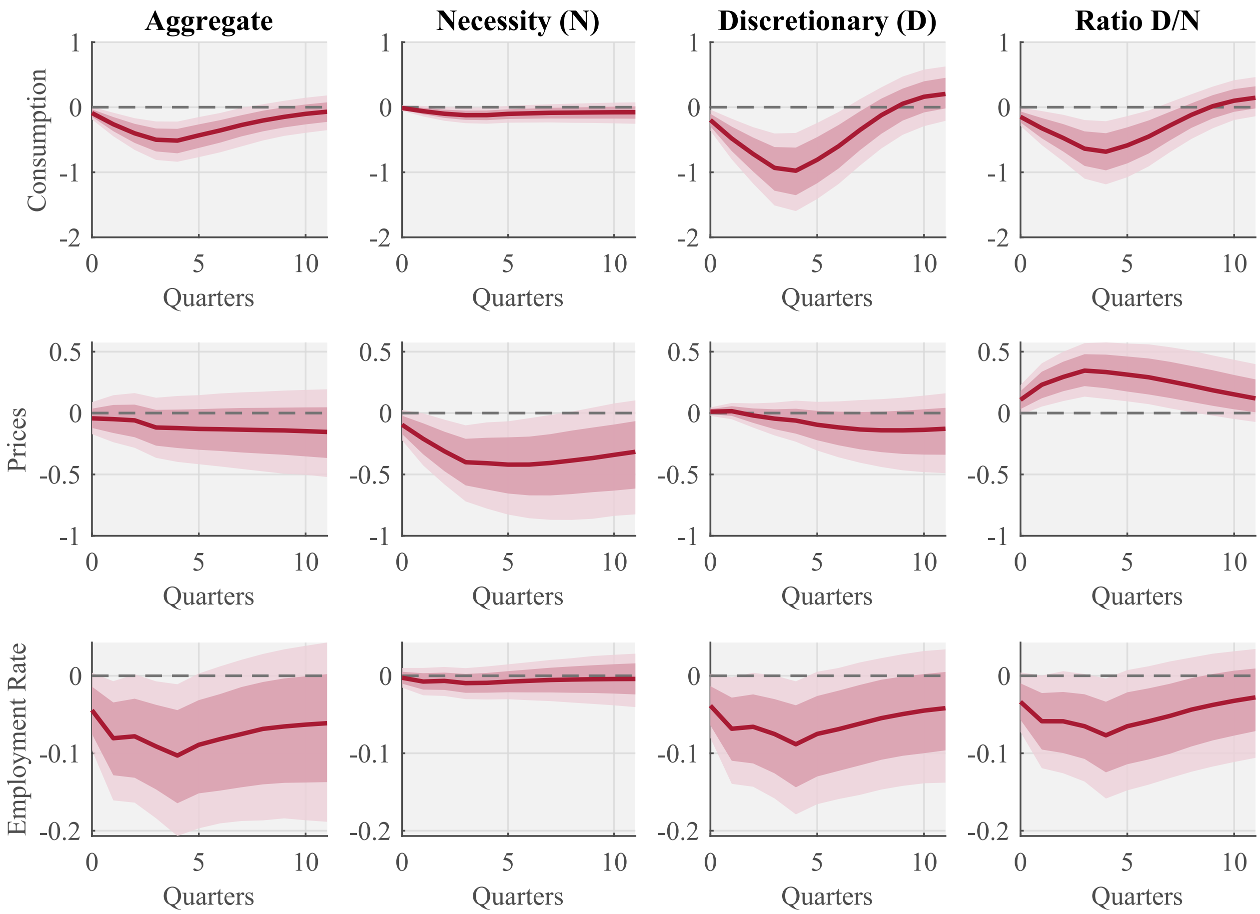
Figures C.6 , C.7, C.8 and C.9 report the IRFs for our primary variables of interest, derived from estimating the BVAR model using sign restrictions. These results are consistent with the findings reported in the main text, where identification is achieved via the "poor man's" approach. Figures C.10 , C.11 C.12 and C.13 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.

Figure C.5: Baseline irfs



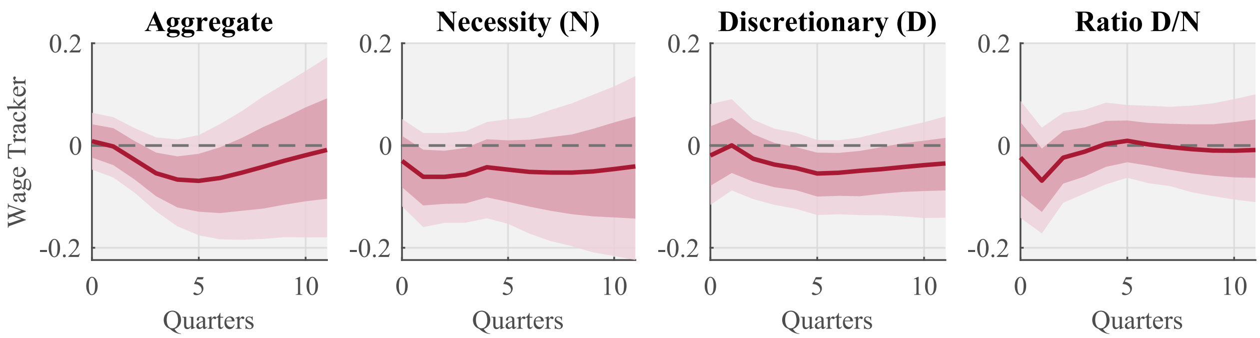

*Notes:* Impulse response functions of control variables across different specification. Column 1 shows the IRFs from our baseline specification, estimated on the full sample from 1999Q1 to 2024Q2, using the poor man's identification of monetary policy shocks. Column 2 displays the IRFs from the sign restriction specification estimated on the same full sample. 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. Column 4 presents the IRFs estimated using the same identification method, but on sample from 2013Q1 to 2024Q2, in which the wage tracker series is available.

Figure C.6: Consumption, Prices, Employment Rate - Sign Restriction Identification



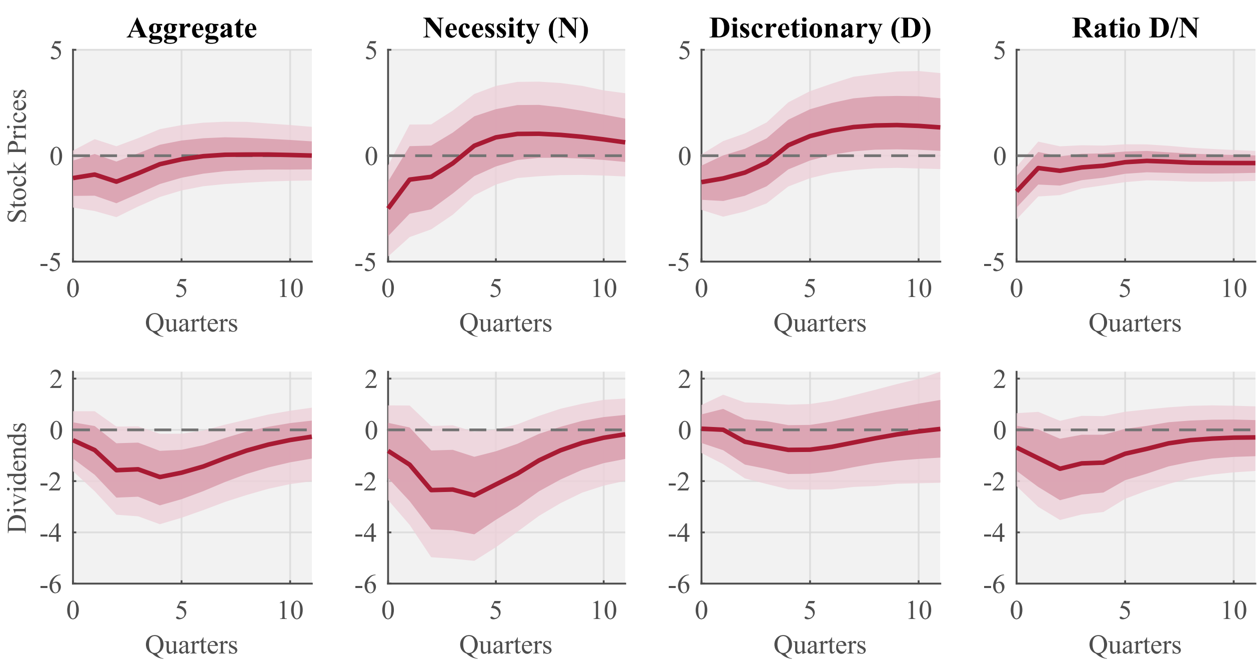

*Notes:* IRFs in response to a one standard deviation monetary policy shock, estimated using a BVAR on a quarterly sample 1999-2024q2 with the alternative sign restriction identification from Jarocinski and Karadi (2020). Median (line), percentiles 16â84 (darker band), percentiles 5â95 (lighter band). 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.

Figure C.7: Negotiated Wages - Sign Restriction Identification



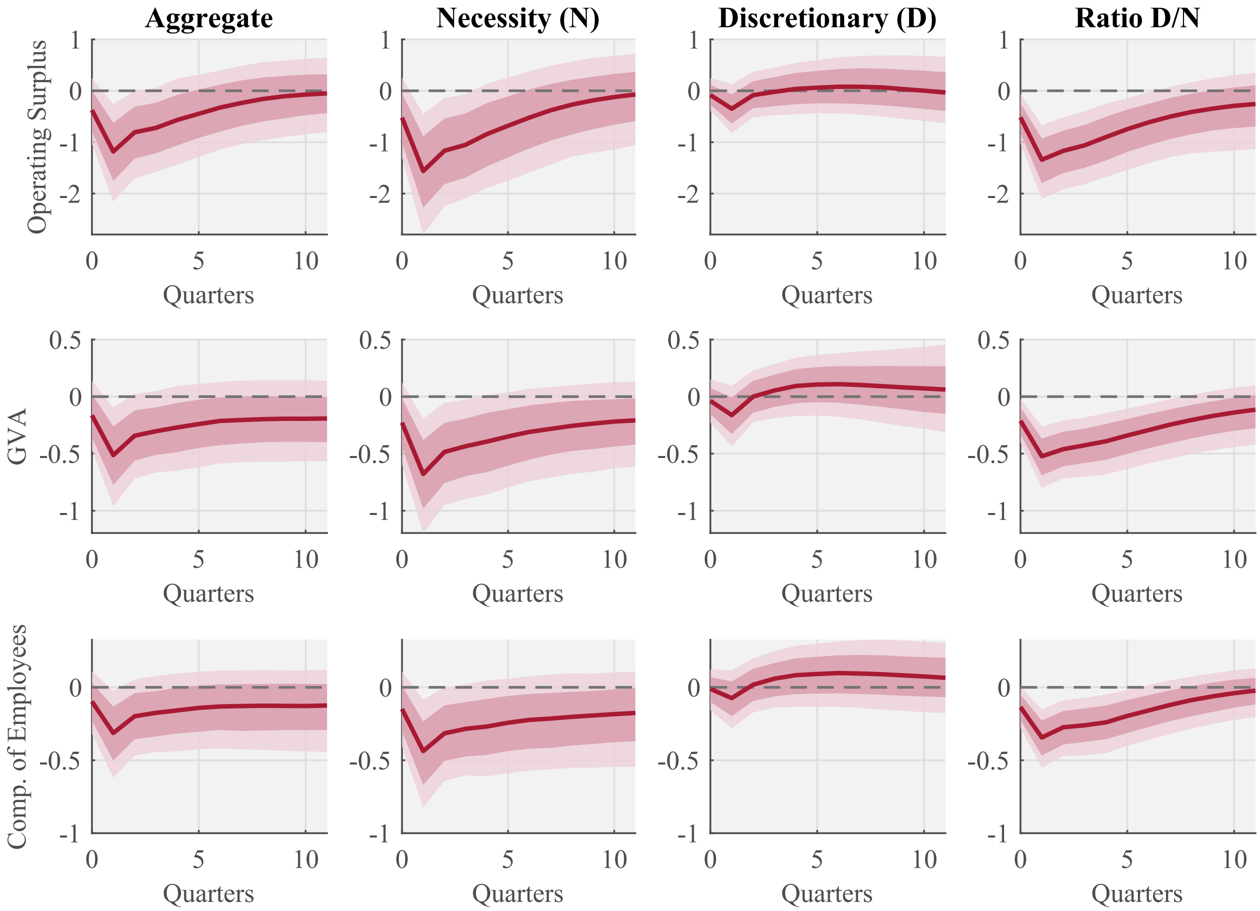

*Notes:* IRFs in response to a one standard deviation monetary policy shock, estimated using a BVAR on a quarterly sample 1999-2024q2 with the alternative sign restriction identification from Jarocinski and Karadi (2020). Median (line), percentiles 16-84 (darker band), percentiles 5-95 (lighter band). 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.

Figure C.8: Stock Price Index and Dividends - Sign Restriction Identification



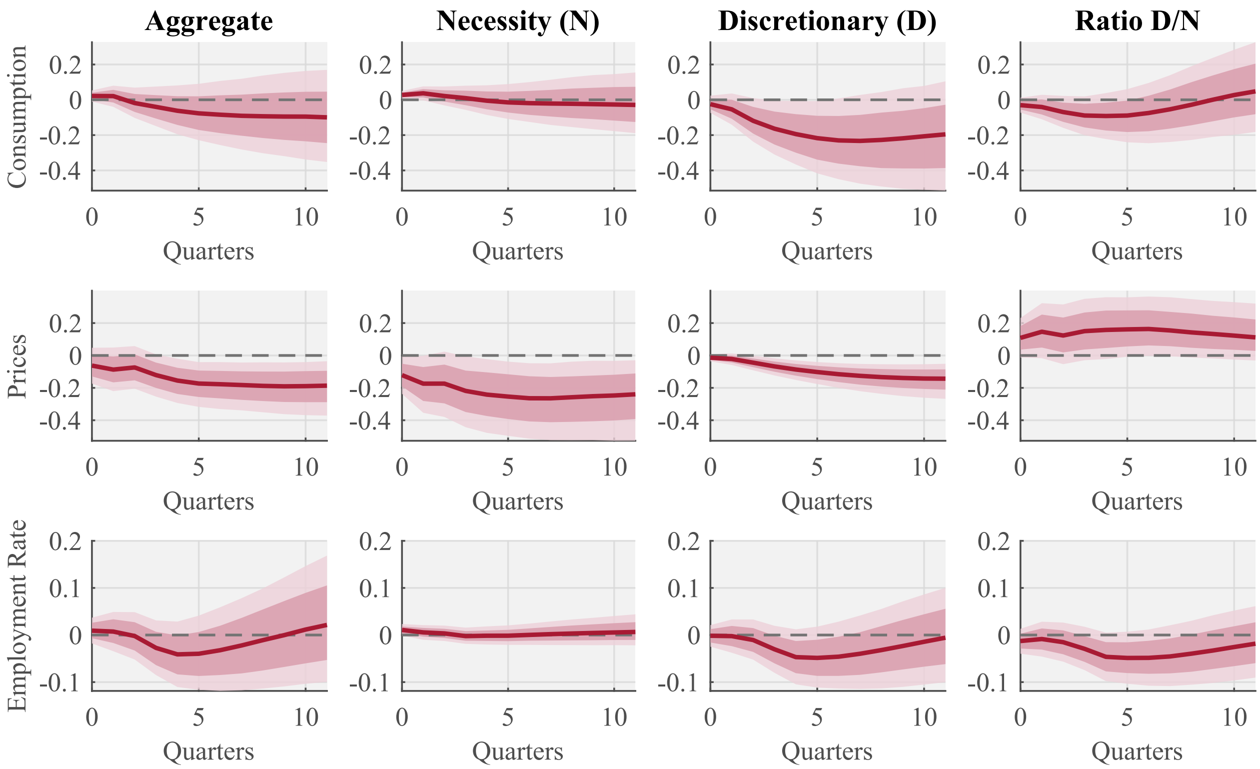

*Notes:* IRFs in response to a one standard deviation monetary policy shock, estimated using a BVAR on a quarterly sample 1999-2024q2 with the alternative sign restriction identification from Jarocinski and Karadi (2020). Median (line), percentiles 16-84 (darker band), percentiles 5-95 (lighter band). 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.

Figure C.9: Operating Surplus, GVA, Compensation of Employees - Sign Restriction Identification



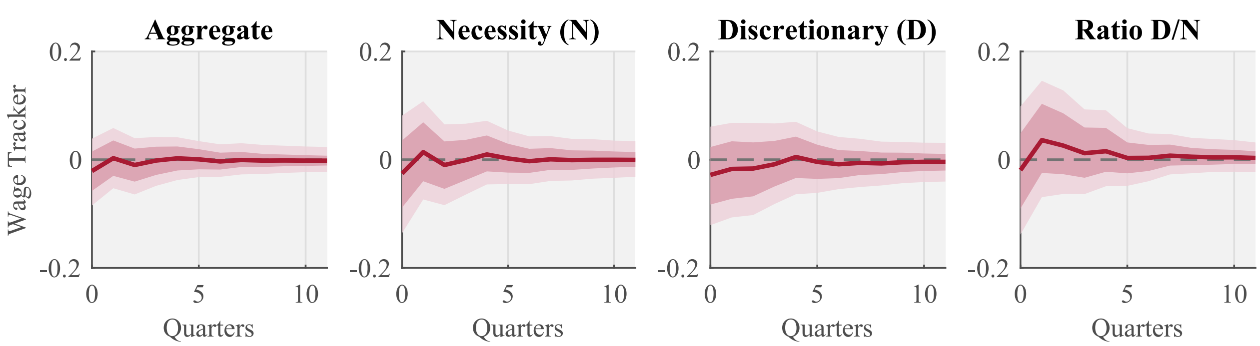

*Notes:*: IRFs in response to a one standard deviation monetary policy shock, estimated using a BVAR on a quarterly sample 1999-2024q2 with the alternative sign restriction identification from Jarocinski and Karadi (2020). Median (line), percentiles 16-84 (darker band), percentiles 5-95 (lighter band). 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.

Figure C.10: Consumption, Prices, Employment Rate - Pre-Covid Sample



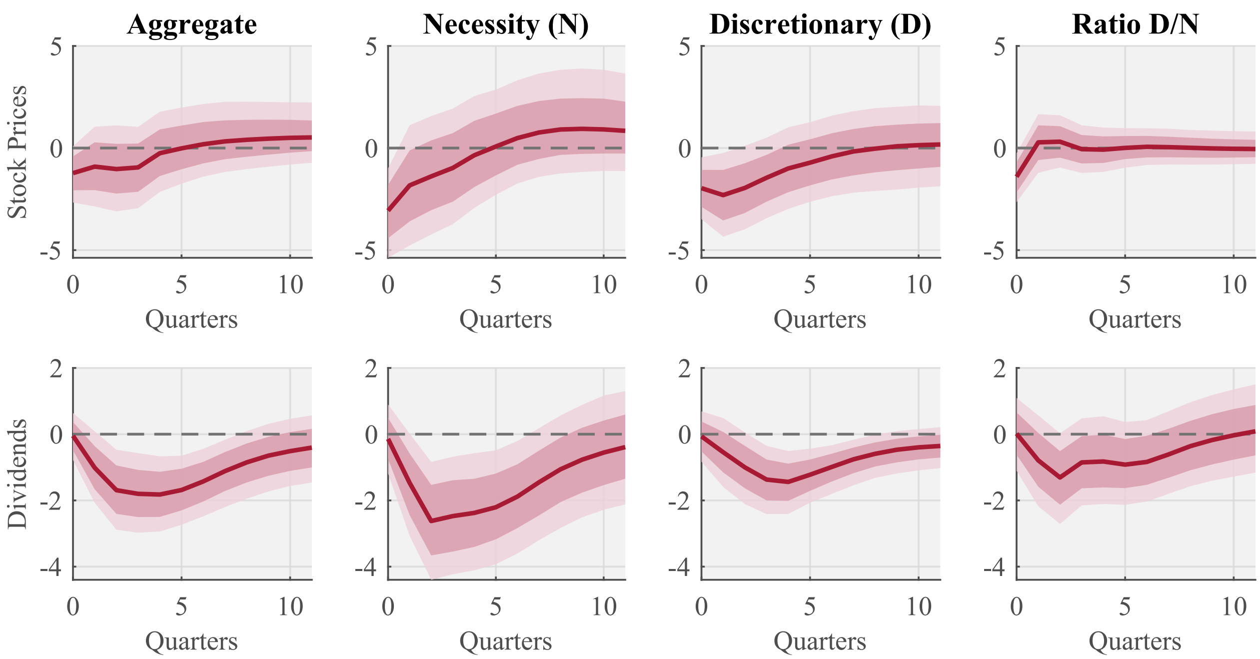

*Notes:* IRFs in response to a one standard deviation monetary policy shock of consumption, HICP and employment rate. IRFs are from a BVAR on a quarterly sample 1999-2024q2. Median (line), percentiles 16-84 (darker band), percentiles 5-95 (lighter band). Quarters on the horizontal axes. Each IRF corresponds 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.

Figure C.11: Negotiated Wages - Pre-covid Sample



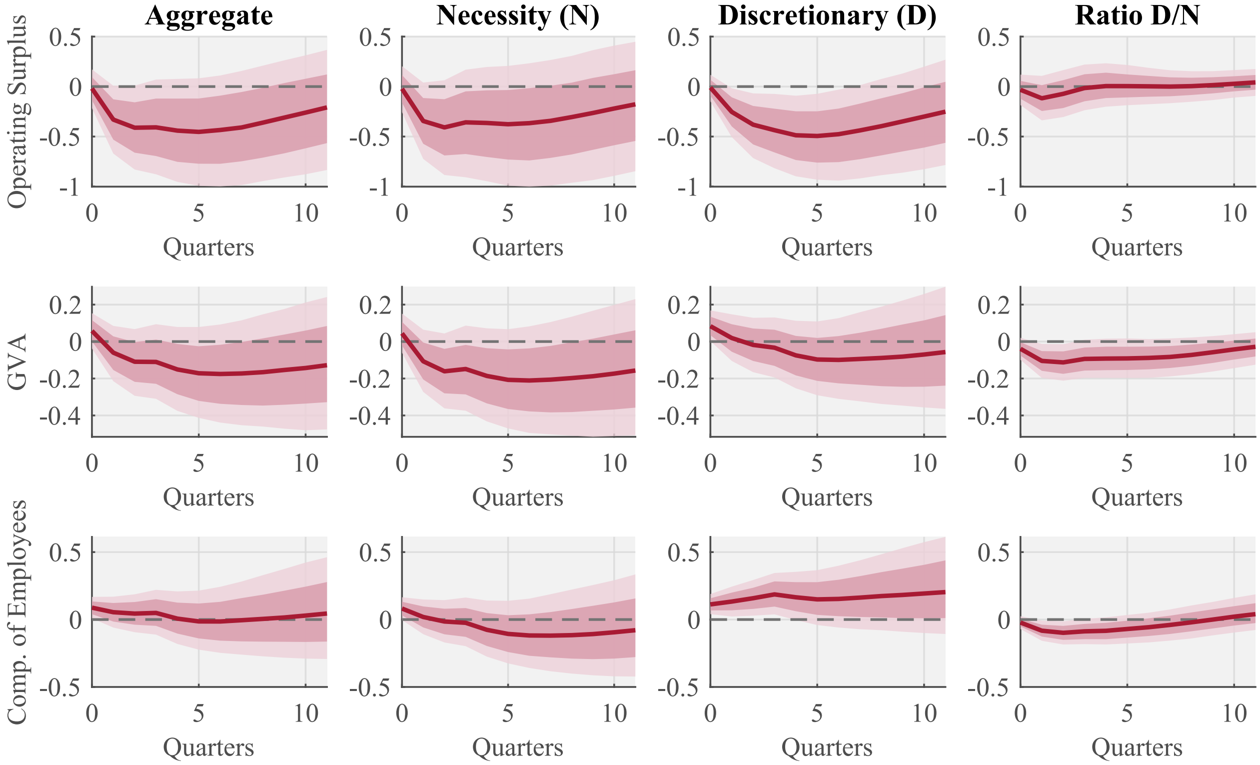

*Notes:* IRFs in response to a one standard deviation monetary policy shock, estimated using a BVAR on a quarterly sample 1999-2019q4. Median (line), percentiles 16-84 (darker band), percentiles 5-95 (lighter band). Quarters on the horizontal axes. Each IRF corresponds to a separate BVAR estimate with 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.

Figure C.12: Stock Price Index 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. 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.

Figure C.13: Estimated IRFs to a contractionary monetary policy shock - National Accounts variables




*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.

# D Model Derivations

This appendix explains the derivations of the theoretical model. We follow closely Andreolli et al. (2024). The key difference is the presence of a symmetric cost-push shock to study optimal policy and heterogeneous price stickiness in the two sectors to match Euro Area micro data. The notation is different, in this paper, discretionaries/luxuries/non-essentials are defined with a superscript D, in Andreolli et al. (2024) with N. Necessities/essentials are defined with a N in this paper, and with an E in Andreolli et al. (2024).

## D.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 $a_{H,t}$:

$$\begin{aligned}
a_{H,t} &= b_{H,t-1}\frac{R_{t-1}}{\pi_t^N} + w_{H,t}N_{H,t} + \Pi^r_{H,t} + t_{H,t} \\
a_{H,t+m+1} &= \prod_{k=0}^{m} \tilde{R}_{t+k+1} a_{H,t} - \sum_{j=0}^{m}\prod_{k=j}^{m} \tilde{R}_{t+k+1}(C^N_{H,t+j} + p^D_{t+j}C^D_{H,t+j}) \\
&\quad + \sum_{j=0}^{m}\prod_{k=j+1}^{m} \tilde{R}_{t+k+1}(w_{t+j+1}N_{H,t+j+1} + \Pi^r_{H,t+j+1} + t_{H,t+j+1})
\end{aligned}$$

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, $\tilde{R}_{t+1} \equiv R_t/\pi_{t+1}^N$ 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 $\Pi^r_{H,t} \equiv \frac{\Pi_{H,t}}{P_t^N}$ as real profits to avoid confusion with inflation.

Households update their expectations only sporadically. Specifically, they update with probability $\lambda$. Somebody who updates today has probabilities $\lambda$ of updating tomorrow, $\lambda(1-\lambda)$ of updating in 2 periods, $\lambda(1-\lambda)^j$ in $j+1$ periods, and so on. 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, say necessities, for today: $C^N_{i,t,0}$ and for the future if they don't update $C^N_{i,t+j,j}$ 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.

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

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 et al. (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 essential 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.

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

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

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

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

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

**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:

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

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:

$$\begin{aligned}
& \varphi (C^N_{L,t,0})^{-\frac{1}{\gamma^N}} = (C^D_{L,t,0})^{-\frac{1}{\gamma^D}} \frac{1}{p^D_t} \\
& (C^N_{L,t+j,j})^{-\frac{1}{\gamma^D}} = \mathbb{E}_t (C^N_{L,t+j,0})^{-\frac{1}{\gamma^D}} \qquad (C^D_{L,t+j,j})^{-\frac{1}{\gamma^D}} = \mathbb{E}_t (C^D_{L,t+j,0})^{-\frac{1}{\gamma^D}}
\end{aligned}$$

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.

$$\begin{aligned}
C^N_{L,t} &= \lambda \sum_{j=0}^{\infty} (1-\lambda)^j \left[ \mathbb{E}_{t-j} \left( (C^N_{L,t,0})^{-\frac{1}{\gamma^N}} \right) \right]^{-\gamma^N} \\
C^D_{L,t} &= \lambda \sum_{j=0}^{\infty} (1-\lambda)^j \left[ \mathbb{E}_{t-j} \left( (C^D_{L,t,0})^{-\frac{1}{\gamma^D}} \right) \right]^{-\gamma^D} \\
\zeta_{L,t} &= (C^N_{L,t})^{-\frac{1}{\gamma^N}} \frac{C^N_{L,t}}{C^N_{L,t} + C^D_{L,t} p^D_t} + (C^D_{L,t})^{-\frac{1}{\gamma^D}} \frac{\varphi}{p^D_t} \frac{C^D_{L,t} p^D_t}{C^N_{L,t} + C^D_{L,t} p^D_t}
\end{aligned}$$

## D.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 $\xi \frac{N^{\chi}_{H,t}}{\zeta_{L,t}} = w_{H,t}$

## D.3 Firms

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

**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, retailers face a possibly heterogenous Calvo friction to change prices, where the probability of not being able to reset prices is equal to $\theta^i$ in each period. This is a first difference from Andreolli et al. (2024). Retailers buy a wholesale good and use it to produce the retail variety $y_{k,t}^i$. The second difference from Andreolli et al. (2024) is that the price they pay is subject to a stochastic disturbance that creates a cost-push shock: $P_t^{i,w} X_t$. $X_t$ 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. This allows us to study how a symmetric shock is propagated asymmetrical in the economy, due to interaction of demand, production, and household heterogeneities. The real marginal cost $\mathcal{S}_t^i X_t = \frac{P_t^{i,w} X_t}{P_t^N}$ is the wholesale price relative to its retail average value, scaled with the stochastic disturbance. They receive a subsidy $\tau^i$ 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. 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.

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

**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:

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

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 $\alpha^i$. 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:

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

## D.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:

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

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

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

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:

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

## D.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:

$$\pi_t^{target} = \omega \pi_t^D + (1-\omega)\pi_t^N$$

As discussed in the main text, the central bank achieves the standard aggregate/CPI targeting by setting $\omega = \frac{p^D C^D}{C^N + p^D C^D}$.

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.

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

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 Bilbiie (2008) or Debortoli and Galí (2024):

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

## D.6 Steady state computation and calibration

We denote the steady-state value of a variable simply by dropping 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 ($\mathcal{S}^N = \mathcal{S}^D = 1$) 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.

Parameters $\alpha^N$ and $\alpha^D$ are chosen to match (i) the fraction, over the total population, of hand-to-mouth households working in the necessity sector ($N_L^N/(\mu_L N_L + \mu_H N_H)$) and the discretionary sector ($N_L^D/(\mu_L N_L + \mu_H N_H)$), ans (ii) the share of necessity consumption for low-skilled ($\bar{C}_L^N = C_L^N/(C_L^N + p^D C_L^D)$) and high-skilled ($\bar{C}_H^N = C_H^N/(C_H^N + p^D C_H^D)$) households.

To calibrate the share of hand-to-mouth households across sectors, we use data from the ECB Household Finance and Consumption Survey (HFCS). The resulting values match those shown in Figure 2: 0.175 in the discretionary sector and 0.085 in the necessity sector. For the share of necessity consumption among low-skilled (0.585) and high-skilled (0.667) households, we rely on Eurostat Household Budget Survey data. In this dataset, we classify low-skilled households as those in the bottom two quintiles of the income distribution, and the necessity/discretionary classification follows our consumption categorization.

The steady state moments we obtain are close to their empirical counterparts: $\bar{C}_L^N = 0.576$, $\bar{C}_H^N = 0.662$, $N_L^N/(\mu_L N_L + \mu_H N_H) = 0.090$, and $N_L^D/(\mu_L N_L + \mu_H N_H) = 0.169$. This close alignment is achieved despite using only two parameters, $\alpha^N$ and $\alpha^D$, to match them.

## D.7 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 competitive equilibrium consists of 28 endogenous allocations $\{\hat{C}_t$, $\hat{C}_t^N$, $\hat{C}_t^D$, $\hat{C}_{H,t}^N$, $\hat{C}_{H,t}^D$, $\hat{C}_{L,t}^N$, $\hat{C}_{L,t}^D$, $\hat{C}_{H,t,0}^N$, $\hat{C}_{H,t,0}^D$, $\hat{C}_{L,t,0}^N$, $\hat{C}_{L,t,0}^D$, $\hat{N}_{H,t}$, $\hat{N}_{L,t}$, $\hat{N}_{H,t}^N$, $\hat{N}_{H,t}^D$, $\hat{N}_{L,t}^N$, $\hat{N}_{L,t}^D$, $\hat{\zeta}_{H,t}$, $\hat{\zeta}_{L,t}$, $\hat{\Pi}_{L,t}^r$, $\hat{\Pi}_t^{r,N}$, $\hat{\Pi}_t^{r,E}$, $\hat{Y}_t$, $\hat{Y}_t^N$, $\hat{Y}_t^D$, $\hat{X}_t$, $\hat{Earn}_t^N$ $\hat{Earn}_t^D\}$, 10 prices $\{\hat{w}_{H,t}$, $\hat{w}_{L,t}$, $\hat{\pi}_t^N$, $\hat{\pi}_t^D$, $\hat{p}_t^D$, $\hat{\pi}_t^{CPI}$, $\hat{\pi}_t^{target}$, $\hat{R}_t$, $\hat{\mathcal{S}}_t^N$, $\hat{\mathcal{S}}_t^D\}$, and 2 exogenous processes $\{\varepsilon_{X,t}$, $\varepsilon_{R,t}\}$; 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-\omega)\hat{\pi}^N_t + \omega\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})
\end{aligned}
$$

$$E\hat{arn}_t^D = \frac{w_H N_H^D}{w_H N_H^D + w_L N_L^D}(\hat{w}_{H,t} + \hat{N}_{H,t}^D) + \frac{w_L N_L^D}{w_H N_H^D + w_L N_L^D}(\hat{w}_{L,t} + \hat{N}_{L,t}^D)$$

The following dynamic equations:

$$\begin{aligned}
\frac{1}{\gamma^N}\mathbb{E}_t\left(\hat{C}_{H,t+1,0}^N\right) &= \frac{1}{\gamma^N}\hat{C}_{H,t,0}^N - \mathbb{E}_t(\hat{\pi}_{t+1}^N) + \hat{R}_t \\
\hat{C}_{H,t}^N &= \lambda\sum_{j=0}^{\infty}(1-\lambda)^j\mathbb{E}_{t-j}\left(\hat{C}_{H,t,0}^N\right) \\
\hat{C}_{H,t}^D &= \lambda\sum_{j=0}^{\infty}(1-\lambda)^j\mathbb{E}_{t-j}\left(\hat{C}_{H,t,0}^D\right) \\
\hat{C}_{L,t}^N &= \lambda\sum_{j=0}^{\infty}(1-\lambda)^j\mathbb{E}_{t-j}\left(\hat{C}_{L,t,0}^N\right) \\
\hat{C}_{L,t}^D &= \lambda\sum_{j=0}^{\infty}(1-\lambda)^j\mathbb{E}_{t-j}\left(\hat{C}_{L,t,0}^D\right) \\
\hat{\pi}_t^D &= \beta\mathbb{E}_t(\hat{\pi}_{t+1}^D) + \kappa^D(\hat{\mathcal{S}}_t^D + \hat{X}_t) \\
\hat{\pi}_t^N &= \beta\mathbb{E}_t(\hat{\pi}_{t+1}^N) + \kappa^N(\hat{\mathcal{S}}_t^N + \hat{X}_t) \\
\pi_t^D &= \pi_t^N + p_t^D - p_{t-1}^D \\
\hat{R}_t &= \rho_R\hat{R}_{t-1} + (1-\rho_R)(\phi_\pi E(\hat{\pi}_{t+1}^{\text{target}}) + \phi_Y\hat{Y}_t) + \sigma_R\varepsilon_{R,t} \\
\hat{X}_t &= \rho_X\hat{X}_{t-1} + \sigma_X\varepsilon_{X,t}
\end{aligned}$$

Where, as standard, we defiled $\kappa^i$ to be the slope of the linearised Phillips Curve for a given sector: $\kappa^i = \frac{(1-\theta^i)(1-\theta^i\beta)}{\theta^i}$.

# E 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 4.

## E.1 Analytical derivation

This section outlines how we derive the welfare loss function shown in Section 5.1. 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 (2003a) to rewrite the supply side of the economy to have highlight the variance of prices. For sector $i = \{N, D\}$:

$$\int_0^1 y^i_{k,t} dk = \int_0^1 \left(\frac{P^i_{k,t}}{P^i_t}\right)^{-\varepsilon^i} Y^i_t dk = Y^i_t \nu^{Pi}_t = C^i_t \nu^{Pi}_t = A^i_t (N^i_{L,t})^{\alpha^i} (N^i_{H,t})^{1-\alpha^i}$$

We focus on the price dispersion variable $\nu^{Pi}_t$. We follow the same steps of Woodford (2003a), define $\hat{p}^i_{k,t} \equiv \log(P^i_{k,t}) - \log(P^i_t)$, take a second order Taylor approximation of $(P^i_{k,t}/P^i_t)^{-\varepsilon^i}$ to arrive at the following approximation:

$$\nu^{Pi}_t \equiv \int_0^1 \left(\frac{P^i_{k,t}}{P^i_t}\right)^{-\varepsilon^i} dk \approx 1 + \frac{\varepsilon^i}{2} Var_k(\log(P^i_{k,t})) = 1 + \frac{\varepsilon^i}{2}\Delta^i_t$$

Where the expectation (and variance) operators are taken with respect to product varieties k: $\mathbb{E}_k(\hat{p}^i_{k,t}) \equiv \int_0^1 \hat{p}^i_{k,t} dk$. With same steps as Woodford (2003a), we first arrive to a dynamic mapping from price dispersion to inflation:

$$\Delta^i_t \approx \theta^i \Delta^i_{t-1} + \frac{\theta^i}{(1-\theta^i)}[\pi^i_t]^2$$

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:

$$\Delta^i_t = (\theta^i)^{t+1}\Delta^i_{-1} + \frac{\theta^i}{(1-\theta^i)} \sum_{s=0}^{t} (\theta^i)^{t-s}[\pi^i_s]^2$$

$$\sum_{t=0}^{\infty} \beta^t \Delta^i_t = \frac{\theta^i}{1-\theta^i\beta}\Delta^i_{-1} + \frac{\theta^i}{(1-\theta^i)(1-\theta^i\beta)} \sum_{t=0}^{\infty} \beta^t [\pi^i_t]^2$$

This will go into the welfare function thought the supply side of the economy: $\hat{Y}^i_t = \hat{A}^i_t + \alpha^i(\hat{N}^i_{L,t}) + (1-\alpha^i)(\hat{N}^i_{H,t}) - \frac{\varepsilon^i}{2}\Delta^i_t$.

**Loss function.** We next derive the loss function. Welfare is defined given some Pareto weights: $\lambda_H$ and $\lambda_L$

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

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 essential 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: $\bar{C}^D \equiv \frac{p^D C^D}{C} = \frac{p^D C^D}{p^D C^D + C^N}$, is the economy wide share of discretionaries, $\bar{C}^D_H \equiv \frac{p^D C^D_H}{C_H} = \frac{p^D C^D_H}{p^D C^D_H + C^N_H}$, is the share of discretionaries in Ricardian consumption, $\tilde{C}^D_H \equiv \frac{\mu_H C^D_H}{C^D} = \frac{\mu_H C^D_H}{\mu_H C^D_H + \mu_L C^D_L}$, 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:

$$
\begin{aligned}
-2\sum_{t=0}^{\infty}\beta^t \frac{\mathcal{W}_t - \mathcal{W}}{C} \approx \sum_{t=0}^{\infty}\beta^t \Bigg[ & (1-\bar{C}^D)\varepsilon^N \frac{\theta^N}{(1-\theta^N)(1-\theta^N\beta)}[\hat{\pi}^N_t]^2 + \bar{C}^D\varepsilon^D \frac{\theta^D}{(1-\theta^D)(1-\theta^D\beta)}[\hat{\pi}^D_t]^2 \\
& - (1-\bar{C}^D)(\hat{C}^N_t)^2 - \bar{C}^D(\hat{C}^D_t)^2 \\
& + \tilde{C}^N_H(1-\bar{C}^D)\frac{1}{\gamma^N}(\hat{C}^N_{H,t})^2 + \tilde{C}^D_H\bar{C}^D\frac{1}{\gamma^D}(\hat{C}^D_{H,t})^2 + (1-\alpha^{avg})\chi(\hat{N}_{H,t})^2 + \\
& + (1-\tilde{C}^N_H)(1-\bar{C}^D)\frac{1}{\gamma^N}(\hat{C}^N_{L,t})^2 + (1-\tilde{C}^D_H)\bar{C}^D\frac{1}{\gamma^D}(\hat{C}^D_{L,t})^2 + \alpha^{avg}\chi(\hat{N}_{L,t})^2 \\
& + (1-\bar{C}^D)\Big((1-\alpha^N)(\hat{N}^N_{H,t})^2 + \alpha^N(\hat{N}^N_{L,t})^2\Big) + \bar{C}^D\Big((1-\alpha^D)(\hat{N}^D_{H,t})^2 + \alpha^D(\hat{N}^D_{L,t})^2\Big)\Bigg] + t.i.p.
\end{aligned}
\tag{8}
$$

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 Figure 6.

- 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 multiply 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.

(8) is the welfare function we use to run our welfare comparison exercises in Sections 5.2, and 5.3. However, 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 $\hat{Y}_t$ and the relative price $\hat{p}^D_t$. This mapping is exact in a model without inattention and it can be found by solving the static equations of the model, listed in Section D.7, for $\hat{Y}_t$ and $\hat{p}^D_t$. This shows that the only thing that matter for these convolution 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 $\hat{Y}_t$ and $\hat{p}^D_t$ as RHS variables and the consumption and labor supply choices as LHS variables. E.g. we express $\hat{C}^D_H = a^{C^D_H}_C \hat{C}_t + a^{C^D_H}_p \hat{p}^D_t$. 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. This allows us to rewrite the loss function in the

standard way:

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

In our baseline exercise, we shut off price stickiness heterogeneity in order to focus on how demand cyclicality interacts with labor markets and household heterogeneity. We do so by picking an average value of $\theta^{avg}$ such that the loss function is unaltered across price stickiness heterogeneity and homogeneity. That is, we set $a_{(\pi^N)^2}+a_{(\pi^D)^2}$ to be the same across the two price stickiness regimes[3], or equivalently, we pick $\alpha^{avg}$ to solve the following equation:

$$((1-\bar{C}^D)\varepsilon^N+\bar{C}^D\varepsilon^D)\frac{\theta^{avg}}{(1-\theta^{avg})(1-\theta^{avg}\beta)}=(1-\bar{C}^D)\varepsilon^N\frac{\theta^N}{(1-\theta^N)(1-\theta^N\beta)}+\bar{C}^D\varepsilon^D\frac{\theta^D}{(1-\theta^D)(1-\theta^D\beta)}$$

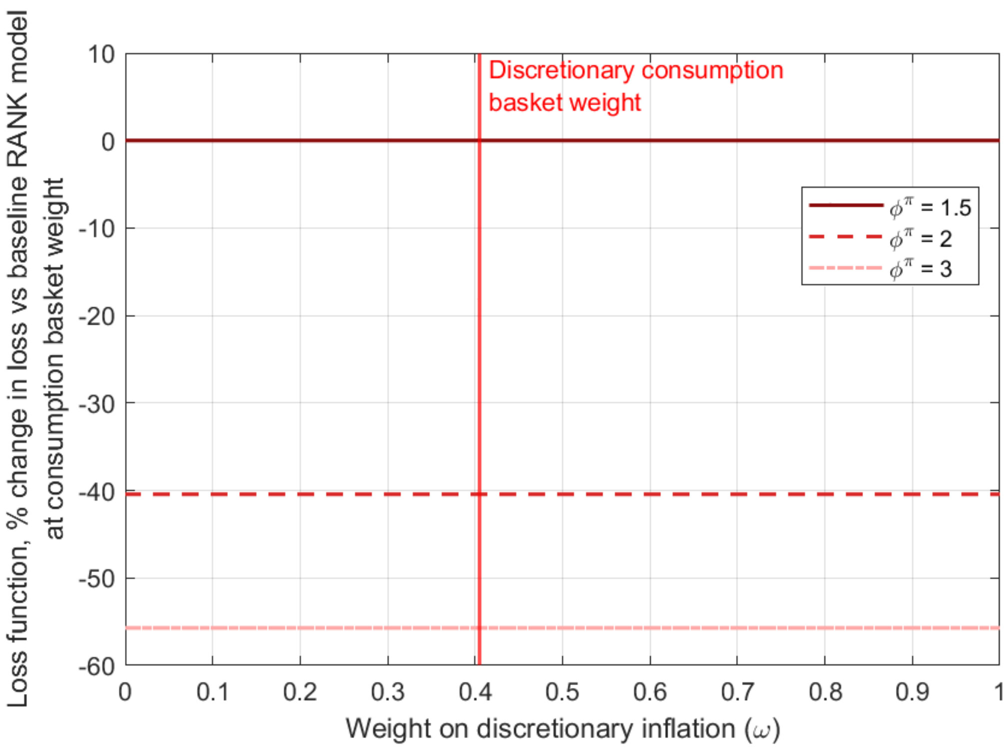
Finally, when we progressively make our model simpler, in Section 5.2, we do this by taking the following steps. When we remove non-homotheticity, we set $\gamma^N=\gamma^D=IES$, equal to average IES in the economy. When we remove sectoral heterogeneity, we set $\alpha^N=\alpha^D=\alpha^{avg}$, so that 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.

## E.2 Additional Results

To complement the findings of panel C of 8 of the main text, Figure E.1 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. Figure E.1 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.

[3] Notice, from equation (8), how $a_{(C)^2}$, $a_{(p^D)^2}$, and $a_{(C,p^D)}$ are unaffected by the price stickiness parameters.

Figure E.1: Welfare loss for range of weights on discretionary inflation $\omega$ in RANK




*Notes:* The expression for the welfare loss function is specified in text. Its value is calculated for different levels of the weight in the Taylor rule on necessity inflation ($\omega$, across the x axis) and for different parameters on inflation in the Taylor rule ($\phi_{\pi}$, different lines). All changes are relative to the baseline inflation weight $\phi_{\pi} = 1.5$ at the necessity consumption basket weight (red vertical line). The corresponding weight on the output gap $\phi_Y$ is set to zero for expositional clarity. This figure shows the results of the representative agent model RANK.