Monetary Policy and Household Consumption under the Microscope*

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Abstract

In the wake of significant rate hikes by the European Central Bank, this paper offers a detailed analysis of the euro area's private consumption and its heterogeneous response to monetary policy. Utilising detailed household expenditure data and high-frequency monetary policy shocks within a local projections model, we provide insights at a new level of granularity on how households adjust their spending on a wide spectrum of goods and services under changing monetary conditions. The study confirms durable goods to be highly sensitive to changes in interest rates, while non-durable goods and services show more resilience. Looking beyond the durability dichotomy, our paper emphasises the crucial role of necessity and finds that both characteristics have an orthogonal significant impact on the sensitivity of consumption to monetary policy.

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1. Introduction

The recent shift in the European Central Bank's (ECB) monetary policy stance, marked by the most significant rate hikes in its history, signals a pivotal transformation in the economic landscape of the Eurozone. This transition from a prolonged period of low interest rates to a more stringent monetary environment amplifies the importance of observing and understanding how the euro area economy will navigate current challenges. These challenges include the lingering impacts of the COVID-19 pandemic as well as ongoing geopolitical tensions, both of which have been reshaping the global economic and financial context significantly.

This paper aims to dissect a crucial aspect of the Eurozone's economic dynamics—private consumption—and its heterogeneous reaction to monetary policy. The question of how monetary policy finds its way through the real economy has long been a subject of rich discussion in economic literature. The fundamental macroeconomic principle of the cost of capital channel implies that lower interest rates exert a positive impact on household consumption by making borrowing more affordable and saving less attractive. In contrast, higher interest rates tend to dampen consumption while encouraging savings. In the post-Global Financial Crisis era, characterised by low cost of capital, the scope of credit usage has expanded beyond traditional large-ticket items such as houses and durable goods to include a more diverse range of needs. Whereas most empirical studies in the field of macroeconomics rely on aggregate data, there has been a growing body of literature making use of more granular data in order to identify and explain heterogeneity in the response of household consumption to monetary policy (Cloyne et al., 2019, Holm et al., 2020, Coskun et al., 2022, Grigoli and Sandri, 2023). While these researches contribute to our understanding of the transmission mechanism by using micro and survey data to examine the heterogeneity of households, our focus is particularly centered on the heterogeneity within consumption items, decomposing them based on their different characteristic traits.

The analysis begins with an examination of consumption, broken down into its core components: goods and services consumption, with a further breakdown of the former into durable and non-durable goods. Consistent with existing literature, we find that durable goods consumption exhibits a heightened sensitivity to interest rate changes (Barsky et al., 2003, Erceg and Levin, 2006, Sterk and Tenreyro, 2018). This sensitivity is attributed to the nature of durable goods, which, being substantial purchases associated with a higher financial burden,

are often financed through debt. McKay and Wieland (2021) complement by finding that, as monetary stimulus increases the stock of durable goods in the present, there is a diminished need for consumers to acquire such items in the future, assuming all else remains constant. This suggests that monetary policy easing effectively boosts aggregate demand for durable goods in the current period by borrowing demand from the future. On the other hand, our results point out higher resilience in non-durable goods and services consumption.

To delve deeper, we explore a more granular breakdown of household consumption by utilising Eurostat's consumption expenditure breakdown aligned with the Classification of Individual Consumption According to Purpose (COICOP) framework provided by the United Nations' Statistics Division. This approach offers novel insights into how individual consumption items react to monetary policy changes and allows us to uncover whether there are other consumption breakdowns, beyond the known durable versus non-durable dichotomy, by which the heterogeneous sensitivity of private consumption to monetary policy can be explained. We introduce a categorisation framework that distinguishes goods and services consumption components by their level of necessity, enabling us to explore the intricacies of consumption behavior in response to monetary policy changes. With the nuanced breakdown of consumption components by purpose, we first find that the significance of the durability of consumption goods observed within the broader component breakdown also holds when examining subcategories in more detail. Beyond this well-established durability factor, we also find that the level of necessity is equally significant in explaining the heterogeneous sensitivity of consumption components to monetary policy. Further utilising the impulse response data for each consumption item, we delve into the consumption patterns of various household groups, examining how different consumption baskets vary in response to monetary policy changes. This analysis enriches our understanding by linking the consumption behaviour of households with their socio-demographic characteristics, such as income levels and age groups.

The model incorporates high-frequency monetary policy shocks that are identified through the co-movement of interest rate and stock index changes during ECB monetary policy events by making use of the comprehensive Altavilla et al. (2019) dataset. The empirical methodology of this paper follows the method of Jordà (2005), utilising a local projections model in a panel across 10 euro area countries that together make up 95% of euro area real gross domestic product and private consumption over the period 2002-2019, offering a flexible approach to

model the interplay between monetary policy and granular consumption data.[1]

Related literature: Incorporating insights from recent literature, this paper acknowledges the differential effects of monetary policy. Changes in interest rates differentially impact various economic agents, depending on their exposure to these rates. Savers and borrowers, for instance, experience opposite effects from a monetary policy action (Coibion et al., 2017, Auclert, 2019). Furthermore, contractionary monetary policy has been shown to exacerbate income and consumption inequalities (Hubert and Savignac, 2023). Related to our approach, Peersman and Smets (2005) and Dedola and Lippi (2005) study the sectoral differences in the monetary transmission mechanism on the supply side, with Peersman and Smets (2005) discovering that the tightening of interest rates has a more pronounced negative effect on industrial output in recessions than in booms. Both studies find significant cross-sectoral heterogeneity in the monetary policy reaction by assessing industry characteristics. They conclude that the differences in monetary policy sensitivity are mainly explained by the durability of the goods produced in the sector, underscoring the traditional interest rate and cost of capital channels, but that other characteristics related to the financial structure and firm size are also significantly related to the monetary policy impact.

Recent studies on how monetary policy affects household consumption make use of micro-level data. Cloyne et al. (2019) use survey data to explore heterogeneous responses of households to monetary policy in the United States and the United Kingdom. They find that households with a mortgage tend to be more sensitive to monetary policy than renters, which in turn are more sensitive than outright homeowners. Related to this finding, Wong (2021) concludes that households with fixed mortgages are less sensitive to monetary policy shocks than households that adjust their mortgages.[2] Further research has connected the likelihood of refinancing to various factors: household age and the size of the loan (Wong (2021)), historical trends in interest rates (Berger et al., 2018, Eichenbaum et al., 2022), and the level of housing equity (Beraja et al., 2018). Using Norwegian administrative data from government registries, Holm et al. (2020) model the sensitivity of households to monetary policy depending on their liquidity position. They find a rather unconventional reaction of high-liquidity households as they respond to a monetary tightening by increasing their consumption, which can be explained by

[1]The countries included are Austria, Belgium, Germany, Spain, Finland, France, Ireland, Italy, the Netherlands, and Portugal.

[2]In their respective studies, Di Maggio et al. (2017), Flodén et al. (2021) both draw similar conclusions on the impact of adjustable mortgages, with the former analysing the United States mortgage design and the latter utilizing Swedish administrative data.

a higher potential interest income. Grigoli and Sandri (2023) confirm this finding by making use of credit card data. Standing out as one of the few studies examining disparities across consumption items, they offer insightful and promising results by leveraging credit card data. The use of such data, available at a daily frequency, provides a significant advantage in precisely matching spending data with monetary policy shocks, allowing for a more nuanced understanding of consumer reactions. This approach is particularly effective in revealing heterogeneous effects of monetary policy across consumer characteristics and also different spending categories, as evidenced by their finding that discretionary items are more reactive to monetary policy changes. Despite these advantages, the authors acknowledge some inherent limitations to this methodology. The dataset, being available from 2017 onwards, does not encompass reactions from past monetary policy tightening and easing cycles. They add that their analysis might underrepresent high-price durable goods like car purchases, primarily due to the nature of credit card transactions. With the additional lack of cash transactions, which is specially significant in the services sector, they caution that the results are more indicative of trends in non-durable goods consumption. Another consideration in using credit card data is the challenge of categorising consumption items based on transaction and vendor names, which does not allow for a granular breakdown. To illustrate, items bought in supermarkets would be categorised as consumer staples, an assumption that may be broadly reasonable but is lacking the precision to accurately capture the full spectrum of goods available in these venues.

The paper aims to build on these findings by more accurately identifying the drivers of heterogeneity across consumption items. Our findings reveal that the level of durability and necessity of goods and services both significantly influence the consumption sensitivity to monetary policy changes, thereby deepening our knowledge of the nuanced effects of monetary policy shifts on different segments of the economy. Furthermore, we find that the consumption baskets of high-income households and younger consumers are more responsive to changes in the monetary stance. This discovery is not only crucial for policymakers at the ECB, who are currently navigating through uncharted waters, but also for stakeholders across the euro area who are affected by these policy decisions.

The remainder of the paper proceeds as follows. Section 3 describes the econometric methods and the identification strategy employed for our analysis. Section 2 details the consumption data used. The empirical findings are presented in Section 4, while Section 5 assesses the validity of our results by conducting several robustness tests. Section 6 concludes.

2. Consumption data

Eurostat provides a comprehensive and detailed dataset on household consumption expenditure, thoroughly disaggregated in alignment with the COICOP framework, which serves as the international reference classification system of household expenditure[3]. This dataset encompasses a wide array of consumption categories at the first two COICOP levels with the level of detail increasing from the two-digit Division to the three-digit Group level (Division: *03 Clothing and footwear*; Group: *03.1 Clothing*), available at an annual frequency. Our study will focus on the latter, more granular level which provides us with a total of 42 categories across the 10 countries included in our panel. This level of detail is pivotal for our analysis, as it allows for a nuanced exploration of consumption patterns across different purposes. To be able to critically assess and compare the influence of durability and necessity on the diverse responses of consumption goods and services to monetary policy shocks, our initial step involves a systematic classification of each COICOP three-digit consumption category by the two distinct characteristics.

Durability refers to the longevity or life span of a good, distinguishing between items that are used over extended periods and those that are consumed more quickly. While Eurostat offers aggregated data for durables, non-durables, semi-durables, and services, a direct link between these aggregates and the more detailed three-digit COICOP components is only provided at the four-digit Class level of consumption components. Consequently, we have manually categorised each three-digit component into durables, non-durables (inclusive of semi-durables), or services, based on the predominant classification of the four-digit components within each three-digit group.[4] Our classification of consumption items by durability yields shares of 9% for durable goods, 31% for non-durable goods and 47% for services; 12% of consumption items cannot be unambiguously assigned to one category as they contain a blend of goods and services and are therefore classified as "mixed".[5]

[3]See 'Classification of Individual Consumption According to Purpose (COICOP) 2018' provided by the United Nations Statistics Division and available at: https://unstats.un.org/unsd/classifications/unsdclassifications/COICOP_2018_-pre-edited_white_cover_version-_2018-12-26.pdf. This document provides an extensive and detailed overview of the COICOP classification system, delineating the methodology and criteria for the categorisation of various consumption expenditures.

[4]We have compared our categorisation with the Eurostat aggregates for durable goods, non-durable goods and services, finding strong correlations of 0.941, 0.996, and 0.999 respectively.

[5]The "mixed" category consists of four consumption items: Dwelling maintanance and repair (i.e. paint, smoke detectors, plumber services, electricians services etc.); personal care (i.e. electric razors, toothbrushes, hairdressing salons, saunas etc.); transport equipment (i.e., tires, baby seats, fuel, mechanic services, car washes etc.); household routine maintenance (i.e., cleaning items, cleaning personnel, gardeners etc.).

The degree of necessity, on the other hand, relates to the indispensability of a good or service. In our analysis, we differentiate consumer staples (necessities) and those perceived as more luxurious (non-necessities). Since neither Eurostat nor COICOP provide explicit definitions for these categories, we adopt a quantitative approach to classify each consumption item by Henry (2014), which involves analysing consumption shares across different income levels. Our primary data source is the Household Budget Survey (HBS) by Eurostat, a detailed survey conducted every five years throughout EU countries. This survey offers insight into household expenditures across various goods and services, structured according to the COICOP framework, which mirrors the classification used in Eurostat's consumption data. By examining the HBS data, we calculate the changes in consumption shares for each item, from the lowest to the highest income quintile. Based on whether a particular item's consumption share increased or decreased with rising income levels, we distinguish necessities, whose consumption share diminishes or remains constant with increasing income, from non-necessities, which are consumed in greater proportions as income rises.

What is particularly crucial in our approach is the recognition that the two characteristics, durability and necessity, operate independently from each other, each exerting its unique influence on consumption patterns. This lets us accurately dissect how these characteristics individually and jointly affect the way households adjust their consumption in response to monetary policy.

For a comprehensive overview of our classification system, we have included an informative table in the Appendix Table A1, providing a reference for readers to contextualise our analysis within the broader framework of household consumption patterns.

3. Econometric methodology

3.1. Empirical framework

In order to assess the impact of monetary policy on private consumption and its components we generate impulse response functions (IRFs) by applying local projections (Jordà, 2005):

$$Y_{i,t+h} = \alpha_{i,h} + \beta_{i,h}\phi_t + \gamma_{i,h}X_{t-1} + \epsilon_{i,t+h} \tag{1}$$

where i denotes the country and $t \in \{2002,\ldots,2019\}$ and $h \in \{0,\ldots,4\}$ denote the year and the IRF horizon, respectively. Our main focus centers on the coefficient $\beta_{i,h}$, denoting

the percentage point responses at horizon h of each consumption component of interest $Y_{i,t+h}$ (in log-levels) to a 10 basis point monetary policy shock, denoted as ϕ_t. X_{t-1} is a vector of control variable, which all enter the equation on the euro area aggregate level and with a lag of one year. The design of high-frequency monetary policy shock identification brings the advantage that due to the narrow time window of measurement it is unlikely that any other event than the ECB monetary policy announcement is responsible for the uncovered reactions, arguably making it obsolete to control for any additional variables. However, to address potential bias and counter any information loss that might arise from the aggregation process, we add the following control variables in one-year lags to our model. These include the dependent variable, the monetary policy shock, inflation as measured by the Harmonised Index of Consumer Prices (HICP), the unemployment rate, real disposable income, and the household debt-to-income ratio. To also control for the systematic component of monetary policy—the anticipated share of interest rate changes—and thus decouple the impact of unanticipated monetary policy changes on consumption dynamics, our model also includes the 3-month OIS rate, consistent with existing empirical research. We saturate the model with country fixed effects $\alpha_{i,h}$, given that we are estimating a panel of ten euro area countries. Our standard errors are robust to heteroscedasticity, controlling for serial autocorrelation and spatial dependence across countries by using Driscoll and Kraay (1998) standard error corrections. Given the availability of Eurostat consumption data, we estimate the model within an annual setting over the period from 2002 to 2019.[6]

3.2. Monetary policy identification strategy

In order to uncover the causal effect of monetary policy on private consumption, it is crucial to isolate monetary policy shocks from systematic policy responses to the changing macroeconomic environment. To achieve this, we identify exogenous shocks using an approach that follows a growing strand in the literature which builds on the co-movement of high-frequency data on interest rates and stock market prices during the central bank monetary policy announcements. Such an approach was established by Kuttner (2001) and Cochrane and Piazzesi (2002) and has since been increasingly adopted in the literature (Gürkaynak et al., 2005, Piazzesi and Swanson, 2008, Barakchian and Crowe, 2013, Gertler and Karadi, 2015). While these papers study the impact of US monetary policy, there has been a growing body of literature applying this

[6]We exclude the years 1999-2001 due to volatile and noisy OIS data during the first years of the Euro, following the recommendation of Altavilla et al. (2019).

approach for the euro area (Altavilla et al., 2019, Auer et al., 2021, Jarociński and Karadi, 2020). We build on this literature by using the comprehensive high-frequency dataset of Altavilla et al. (2019) where we extract the changes of Overnight Index Swap (OIS) rates and the Euro Stoxx 50 index within the time period of the full ECB monetary event[7]. We incorporate changes in the Euro Stoxx 50 index during the event window following the intuition of Jarociński and Karadi (2020), ensuring that the monetary policy shock measure is free from the so-called information effect. This effect can be caused by the central bank presenting a positive economic outlook at the press conference despite a tightening decision, leading to increased optimism in the stock market. Hence, we impose the restriction that interest rates and equity prices move in the opposite direction with the underlying assumption that an increase in the interest rate lowers the net present value of future dividends, assuming all else remains constant. As hinted before, this technical framework we employ for identifying monetary policy shocks offers a distinct advantage: it captures changes in interest rates and stock market prices within a narrow timeframe. This precision largely ensures that the reactions observed are predominantly attributable to the ECB's monetary policy announcements as it is highly unlikely that any other shock systematically occurs at the same time. There are two methodologies provided in Jarociński and Karadi (2020): the so-called *poor man's* method as well as the more technical sound method identifying shocks in a sign restrictions vector autoregression (VAR). Our model utilises the latter method as the baseline for shock identification. This approach leverages the co-movement between the Euro Stoxx 50 and the first principal component of a range of OIS rates (1-month, 3-month, 6-month, and 1-year) as the indicator of interest rate changes, thereby potentially capturing effects of forward guidance along with traditional policy instruments. For purposes of validating our findings, we will also incorporate the poor man's shock at a subsequent stage for robustness analyses. This measure is also constructed based on the co-movement of the Euro Stoxx 50 and the same first principal component of OIS rates. Instead of using this two series in a VAR, this measure simply eliminates all observations where the interest rate and stock price move in the same direction. It has found great acceptance in the literature for capturing the effect of monetary policy, and is therefore a convenient instrument for verifying the plausibility of our results. Aggregating the monetary policy shock series to annual frequency, we follow the intuition of Ottonello and Winberry (2020) by assigning a higher weighting to the shocks that occurred earlier in the year, as these have a longer time

[7]Change in the median quote from the window 13:25-13:35 before the press release to the median quote in the window 15:40-15:50 after the press conference.

to unfold their effects over the course of the year. Our results will present the reactions of household consumption components to a 10 basis points monetary surprise tightening over one year.

4. The impact of monetary policy on consumption

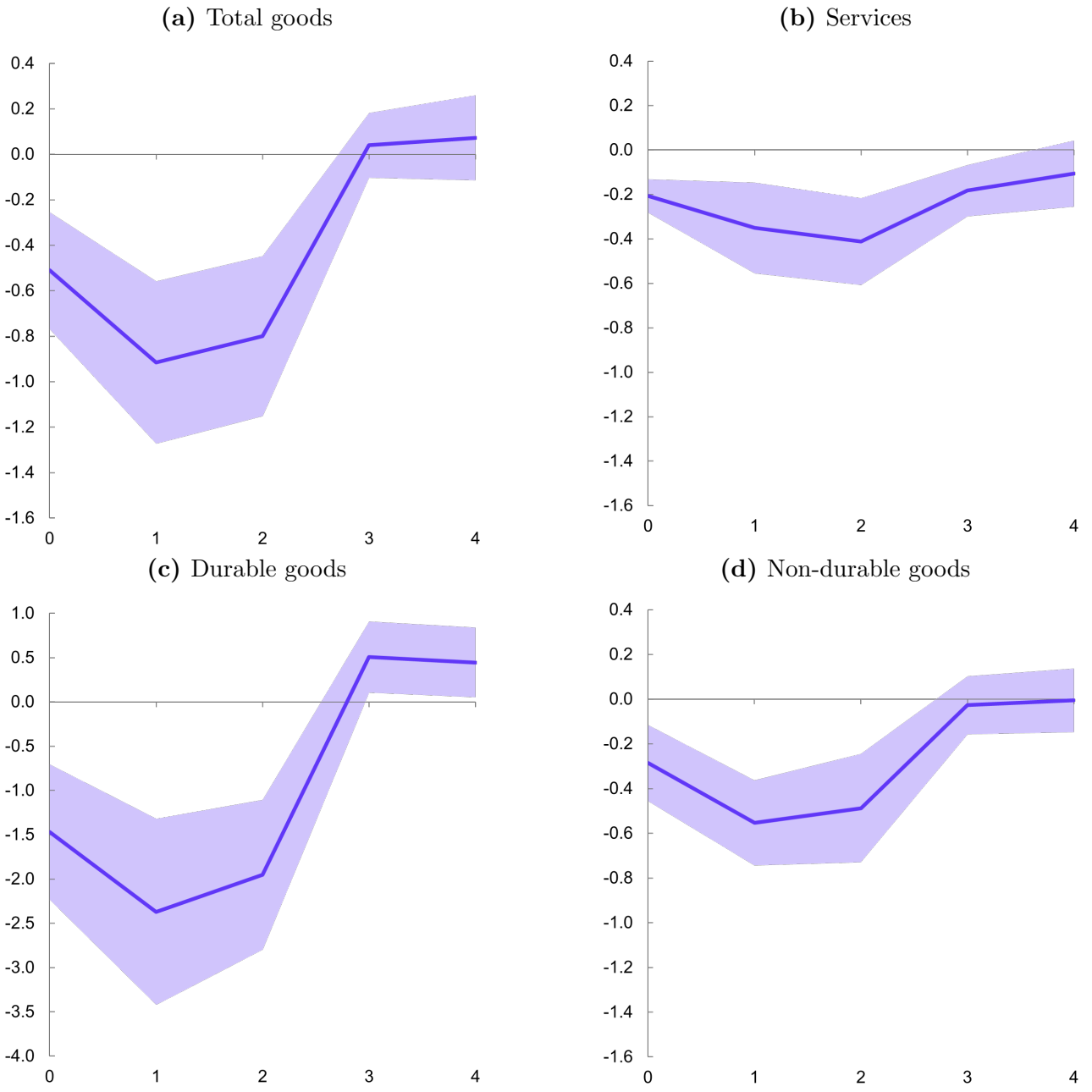
In this section, we present the baseline findings on the transmission of monetary policy across household consumption components, utilising the consumption data outlined in Section 2 and the monetary policy shocks detailed in Section 3.2. We begin by examining how interest rate changes affect consumer spending across the consumption components by durability: durable goods, non-durable goods and services, as detailed in Section 4.1. Following this, we delve into a more granular analysis in Section 4.2, analysing the response of consumption at the COICOP three-digit Group level. The durability and necessity characteristics are indicated for each of these components, to explore the extent of heterogeneity within groups. In Section 4.3, we present the results of the COICOP three-digit components, aggregated into necessities and non-necessities. Incorporating results from all described analyses, we set the stage for a discussion on the underlying factors of observed heterogeneity in Section 4.4. Sections 4.5 and 4.6 make further use of the obtained results by investigating the responsiveness of the consumption baskets of households by different characteristics and by looking into heterogeneity across the countries in the panel.

4.1. Impact on consumption components by durability

The first set of results presents the impulse response functions of the household consumption core components, as reported in Figure 1. Each component shows negative responses to a monetary tightening that are statistically significant at the 95% confidence level, albeit substantial differences regarding timing and magnitude of the impacts. Taking a first look at all panels in Figure 1, it becomes clear that the consumption of goods appears to be more sensitive than that of services. Consistent with the findings in existing literature, Panel 1c demonstrates that spending on durable goods exhibit the greatest sensitivity to an unexpected tightening in interest rates, compared to all other components. The strong reaction, characterised by both the swiftest onset and the highest peak impact—reaching a trough response of -2.4% after one year—may reflect the high share of large-ticket items within this category. Correspondingly, this leads to a heightened reliance on debt financing, which may explain the acute reaction to

changes in interest rates. Conversely, non-durable goods and services, as showcased in Panels 1d and 1b, exhibit a far more resilient response to monetary tightening—with peak responses of -0.6% and -0.4%, respectively and servicing reaching its peak after two years. The greater resilience could be indicative of the inherently consistent demand for these categories, which are often comprised of day-to-day, small-purchase items that do not require any external financing.

Figure 1: Impulse response functions of goods and services consumption
(percentage)



Notes: These charts report impulse responses to a 10 basis points monetary policy surprise tightening. The shaded areas represent 95% confidence bands, respectively, and the horizontal axes refer to the horizon of the IRFs (in years). Non-durable goods also include semi-durable goods.

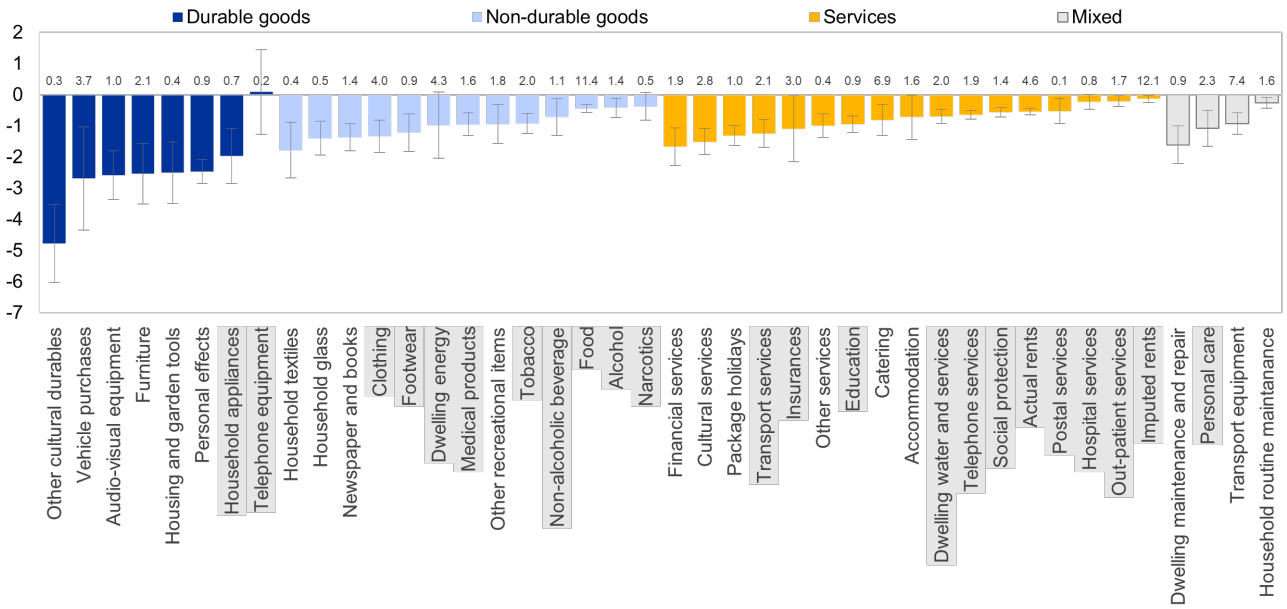
The observed delineation across the various consumption categories clearly demonstrates that the durability of consumer goods is a key factor when determining how strongly consumers adapt their spending to a monetary policy shock. For the next set of results, we will further refine our analysis by breaking down these broad consumption categories into their subcomponents, utilising the Eurostat consumption breakdown aligned with the COICOP framework. This detailed examination aims to uncover additional layers of heterogeneity and assess the role of necessity in shaping the consumer's reaction to monetary policy changes.

4.2. Impact on COICOP three-digit group level components

Figure 2 breaks down the response of consumer spending in 42 consumption components by showing the peak impact of a 10 basis points monetary tightening. It becomes immediately noticeable that the heterogeneity pattern found in the first set of results—showing the responses of consumption categories by durability—is also reflected in the granular set of reactions. Within the non-durable goods components, household glass and textiles exert the strongest reactions which may be explained by the fact that most items in these components are semi-durable—further underlining the significance of durability. Housing water, food as well as alcohol and narcotics, on the other hand, are least impacted by monetary policy. When looking at the expenditure components related to services, financial and cultural services as well as package holidays react the strongest, while health-related services and rental expenditures are hardly affected.

Further analysing the respective components within the non-durable goods and services categories, we find a relatively wide range of impact sizes. On the contrary, the impacts on the durable goods components are more homogeneously distributed. With the most components being on a very similar level regarding their peak impact magnitude, the only two outliers are the very strong response of major cultural durable goods—with a response that is nearly double as strong as the aggregate durable goods, and the weaker responses of housing appliances and telephone equipment—the latter showing no significant reaction to a monetary shock. We can conclude that the durability of a good is a significant driver of monetary policy sensitivity but yet, there may be room for further explanation when looking at the heterogeneous reactions within each expenditure category, specially in the services section as components from this category cannot be differentiated by durability. To be able to further explain the heterogeneity that you can find in this set of results, the next subsection proceeds to group each COICOP group level component to new aggregations of necessities and non-necessities.

Figure 2: Peak responses of consumption components at COICOP three-digit group level
(percentage)



Notes: This chart reports peak impacts of a 10 basis points monetary policy surprise tightening across consumption subcomponents. "Mixed" stands for categories at the three-digit COICOP group level that cannot be clearly assigned to durables, non-durables or services as they consist of a mixture of these classes. Consumption items with grey shaded area are classified as necessities. Education is shown at the COICOP two-digit level as the five three-digit breakdown components consist of smaller volatile values and had many missing observations. The vertical ranges show the respective 95% confidence bands. The numbers above the consumption items indicate their respective share of total consumption for the 10 countries over the period 2002-2019. Non-durable goods also include semi-durable goods.

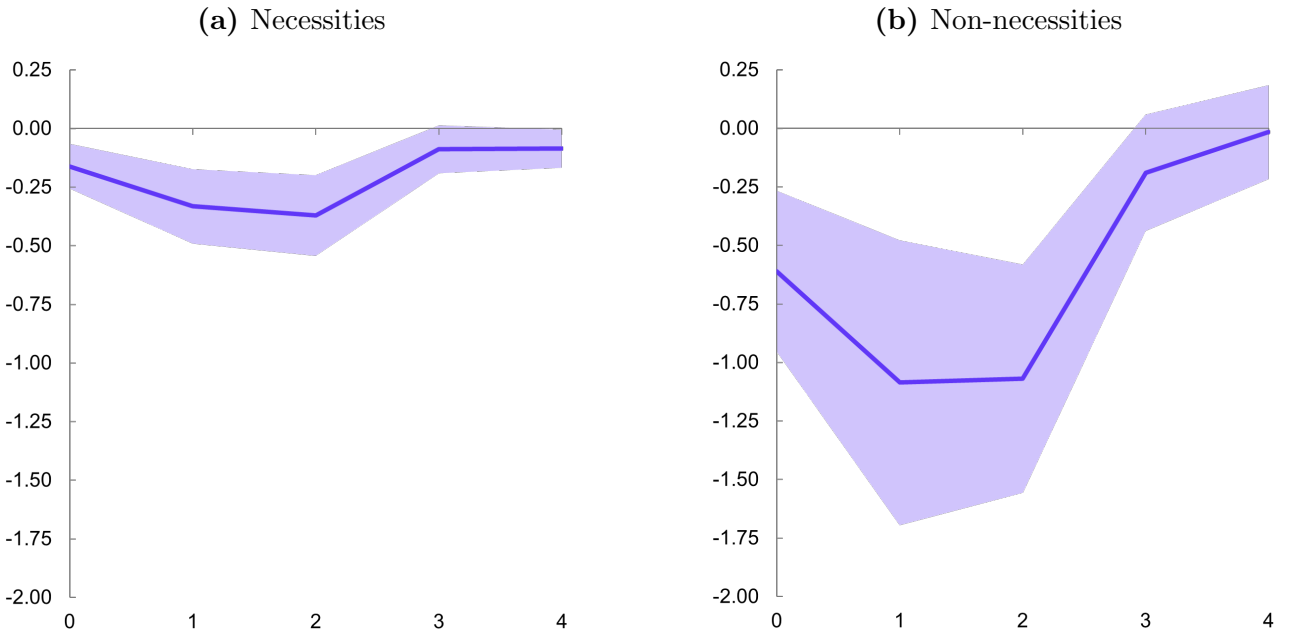
4.3. Impact on consumption components by necessity

Moving on from the disaggregated COICOP three-digit level breakdown, we turn to a re-aggregation of consumption by the level of necessity. Figure 3 reports the reaction of necessities and non-necessities. With very narrow confidence bands and thus, high statistical significance, goods and services classified as necessities are only weakly impacted by monetary policy. They gradually respond with a peak impact of -0.4% after two years, as reported in Panel 3a. Goods and services classified as not necessary show more immediate and stronger reactions with a trough impact of -1.1% after one year (Panel 3b).

4.4. Heterogeneity by consumption item characteristics

The closing part of our analysis seeks to elaborate on the significance and differences between the two dichotomies—durability and necessity—evident in our earlier findings. To this end, we employ the individual impulse responses to a 10 basis points monetary policy shock of all COICOP three-digit consumption components, the same that are shown in Figure 2, regressing them against two binary variables: one indicative of durability and the other of non-necessity.

Figure 3: Impulse response functions of consumption by necessity
(percentage)



Notes: These charts report average IRFs to a 10 basis points monetary policy surprise tightening. The shaded areas represent 95% confidence bands, respectively, and the horizontal axes refer to the horizon of the IRFs (in years).

The choice to use a non-necessity dummy, as opposed to one for necessity ensures that the coefficients share a consistent sign, allowing a more straightforward interpretation of the results. We conduct separate regressions for the coefficients of the monetary policy shock at distinct time horizons. Specifically, we regress these coefficients at the initial impact (h=0), after one (h=1), two (h=2), three (h=3) years, and at the time of peak impact, utilising the following equation:

$$I_{c,h} = d_c + n_c + \epsilon_{c,h} \tag{2}$$

where $I_{c,h}$ denotes the impulse response of COICOP three-digit consumption component c at the IRF horizon $h \in \{0, 1, 2, 3, h_{min(I_{c,T})} \mid T \in \{0,\ldots,4\}\}$. The variables d and n denote the binary indicators for durability and non-necessity, respectively.

The regression analysis presented in Table 1 offers insightful findings on the heterogeneity of monetary policy impacts across different consumption categories. Both binary indicators, durability and non-necessity are statistically significant drivers of sensitivity of a good or service to monetary policy. The pronounced sensitivity of durable goods to monetary policy is yet again evidenced by the negative coefficients across all time horizons, with particularly strong statistical significance at the initial impact and one year post-shock, indicated by coefficients of

Table 1: Drivers of heterogeneity of monetary policy impact

	Impact	1-year	2-year	3-year	Peak impact
Durability	-0.622***	-1.036**	-0.707	0.677	-1.284***
	(0.007)	(0.036)	(0.300)	(0.393)	(0.005)
Non-necessity	-0.474***	-0.753***	-0.791**	-0.707*	-0.629***
	(0.002)	(0.004)	(0.021)	(0.087)	(0.009)
Observations	42	42	42	42	42
Adjusted R^2	0.400	0.411	0.238	0.077	0.532

Notes: The durability and non-necessity dummies have a correlation coefficient of 0.27. Robust p-values in parentheses. *** p<0.01; ** p<0.05; * p<0.1.

-0.6% and -1%, respectively. The peak impact shows the most substantial effect, both economically and statistically, with an elasticity of -1.3% at the 1% confidence level. While the two-year effect also shows a negative sign, the coefficients of the two- and three-year impacts show no statistical significance which emphasises that most durable items react more immediate to a monetary shock and that the recovery of those is less homogeneous. Similarly, non-necessity items exhibit a notable decrease in consumption in response to monetary policy shocks. The coefficients are consistently negative across all time frames, with highly statistical significance throughout the horizons, reflecting a sustained sensitivity of non-necessary goods and services consumption to monetary policy changes. The peak impact, while highly statistically significant, shows a less pronounced effect compared with the durability dummy, with a coefficient of -0.6%.

The overall outcome is in line with the findings from previous analyses: both characteristics—durability and necessity—have a significant orthogonal impact on the sensitivity of consumption items to monetary policy. This means that a durable good is even more sensitive when it is also a non-necessity and vice versa. Another benefit of the necessity classification is that it fully covers total consumption, whereas it is not possible to theoretically dissect services—which makes up almost 50% of consumption—by durability. The argument is further bolstered when taking a closer look at the least sensitive consumption components at COICOP three-digit level within their respective category in Figure 2. It becomes apparent that a high share of these goods and services are necessities: food or medical products for non-durable goods; health-related services or rental expenditures for services. Even within the durable goods components, this pattern holds. Household appliances react less then the other components which may well be explained by the fact that they are classified as necessary. Items like refrigerators or washing machines are more likely to be a necessary need for households than cultural durable

goods like camper vans or audio-visual equipment as cameras. Considering the least sensitive item within the category of durable goods, the reaction of telephone equipment to monetary policy is particularly noteworthy, being the only durable good component with no significant response. Further supporting our classification of communication equipment such as mobile phones, computers, laptops, and tablets as necessities, is their increasingly indispensable role in contemporary daily life. These devices, central to both personal and professional realms, have evolved into fundamental tools, possibly making their demand appear to be resilient to economic shifts and financial pressures stemming from interest rate shocks.

4.5. Heterogeneity by household characteristics

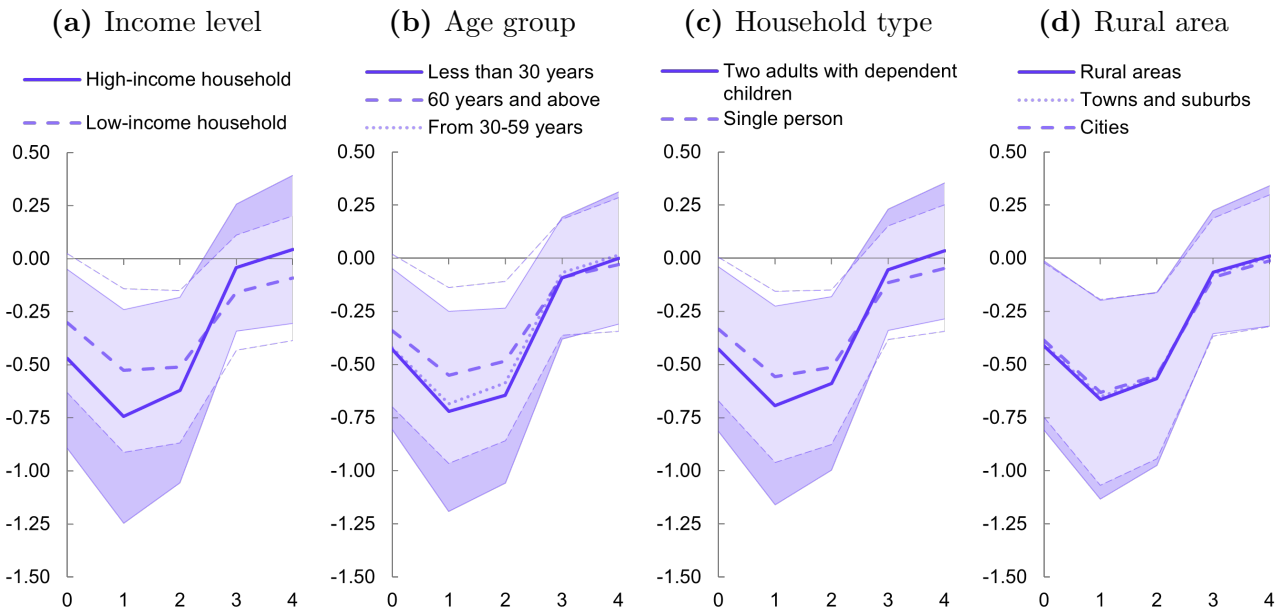
Building upon the detailed impulse response data for each COICOP three-digit component as presented in Section 4.2, we have incorporated an additional dataset from Eurostat's Household Budget Survey (HBS). Conducted every five to six years since 1988, the HBS provides comprehensive information on consumption expenditure by COICOP purpose, along with essential household-specific details like consumer age, income level, and other socio-demographic characteristics. This dataset closely aligns with the COICOP consumption breakdown and thus integrates well with the findings we have presented.

A notable limitation of the HBS is its low frequency of data collection, which does not allow for an analysis of immediate behavioural responses to macroeconomic shocks. However, under the assumption that consumption shares by household characteristics remain relatively stable over time, we have merged information from the HBS with our impulse response data for each consumption item. This integration enables us to distil the consumption baskets of different household groups and assess which are more sensitive to changes in monetary policy.

In our analysis, we specifically focus on two key characteristics of consumer groups as illustrated in Figure 4: income level and age group. Our findings indicate a more pronounced response in the consumption baskets of higher income households to monetary policy surprises. As detailed in Panel 4a, there is a peak impact differential of 0.2 percentage points, with the peak response occurring one year following the shock. When examining the age groups of consumers, as shown in Panel 4b, we observe that the differences in response to monetary policy are less marked than those seen across income levels. In comparing the consumption baskets of consumers under 30 years with those in the middle age category, our analysis reveals no significant difference. However, when comparing to the consumer group aged 60 years and above, the consumption basket of younger consumers exhibits a stronger reaction to monetary

policy shifts, notably by 0.17 percentage points.

Figure 4: Heterogeneity across households
(percentage)



Notes: These charts report average IRFs to a 10 basis points monetary policy surprise tightening. The shaded areas represent 95% confidence bands, respectively, and the horizontal axes refer to the horizon of the IRFs (in years).

When testing for heterogeneity by household type and urbanisation, as detailed in Panels 4c and 4d, our findings reveal more subtle variations in the sensitivity of consumption baskets to monetary policy among these groups. Notably, the consumption basket of single-person households appears less sensitive compared to that of two-adult households with dependent children. Furthermore, our analysis indicates no distinction in consumption patterns between residents of urban areas and those in more suburban settings.

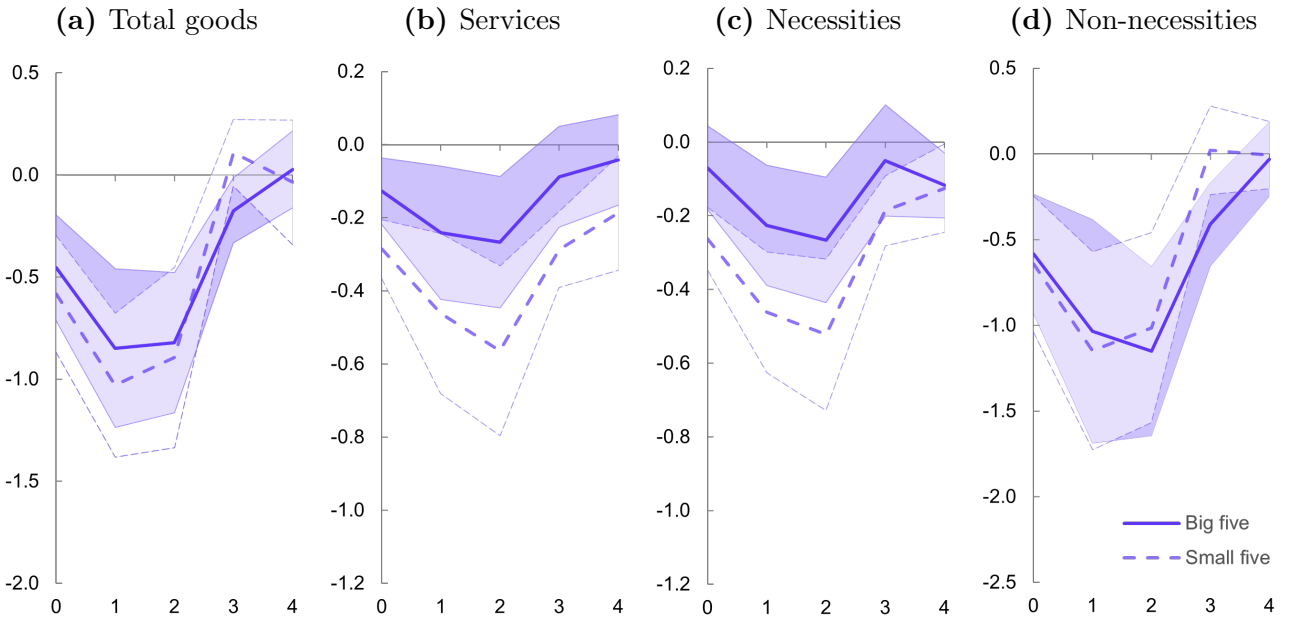
It is important to interpret these results with caution with respect to the limitations inherent in the dataset. Since the consumption shares of the various households are not recorded in time series, but are rather snapshots, it cannot be argued that households with a high income or younger aged consumer react more strongly per se. The results rather suggest that the consumption baskets of these groups are more strongly affected by monetary policy. Nevertheless, the findings align closely with those reported in Grigoli and Sandri (2023). Their data brings the advantage that behavioural adjustments of consumer groups can indeed be observed while meanwhile lacking the completeness of consumption items. Although their study shows a less pronounced difference when comparing age groups, the order of the groups by sensitivity corresponds to our results. Further, they report that high-income households show

a more pronounced reaction to monetary policy, which is also consistent with our findings.

4.6. Cross-country heterogeneity

To fully leverage our panel dataset and delve into heterogeneity across another dimensions, this section highlights how the largest five and the smaller five countries respond differently to the ECB's monetary policy decisions. Our analysis reveals that the smaller five countries exhibit a more pronounced reactivity to these policy changes. Looking within the consumption breakdowns we find that while there are no notable differences in the consumption of goods and non-necessities (Panels 5a and 5d), we see sizable heterogeneity in the consumption of services and necessities (Panels 5b and 5c).

Figure 5: Heterogeneity across countries
(percentage)



Notes: These charts report average IRFs to a 10 basis points monetary policy surprise tightening. The shaded areas represent 95% confidence bands, respectively, and the horizontal axes refer to the horizon of the IRFs (in years).

5. Robustness

To ensure the robustness of our findings, we modify the specification of our baseline model by considering three alternative approaches. For the first robustness test in Section 5.1, we will employ an alternative measure for monetary policy shocks, previously introduced in Section 3.2. Subsequently, the second robustness test in Section 5.2 utilises various ECB shadow rates

to extend our monetary policy rate indicator. Lastly, the third robustness check in Section 5.3 uses a different aggregation method by simply summing the monetary policy shocks over a year without applying any weighting.

5.1. Poor man's sign restrictions

For the first robustness check we utilise the alternative shock identification strategy provided by Jarociński and Karadi (2020)—the poor man's sign restrictions. This method is technically much more simple, but has yet found great acceptance in the literature. Rather than imposing sign restrictions in a VAR, this measure simply considers only observations of the short-term OIS-rate, at which the stock market shows an opposite sign. Formally, the notation is as follows:

$$\phi_{t,poor} = \begin{cases} OIS_t & \text{if } \text{sign}(OIS_t) \neq \text{sign}(M_t) \\ 0 & \text{otherwise} \end{cases} \tag{3}$$

where $\phi_{t,poor}$ denotes the poor man's monetary policy shock at time t and the variables OIS_t and M_t denote the OIS-rate and the stock market index, respectively at time t. As opposed to the baseline shock which identifies a combination of a monetary policy and an information shock for each observation, this method operates under a more stringent assumption. Namely, it presumes that each observation represents either a pure monetary policy or a pure information shock. The results using the poor man's shock are reported in Table 2 and show very similar results compared to the baseline results: higher economic significance for the durability dummy and a more consistent statistical significance for the non-necessity dummy. The full set of impulse response functions are reported in Appendix Figure B1.

Table 2: Heterogeneity drivers using the poor man's method

	Impact	1-year	2-year	Peak impact
Durability	-0.835***	-1.019*	-0.778	-1.372***
	(0.006)	(0.054)	(0.145)	(0.000)
Non-necessity	-0.605***	-0.806***	-0.437**	-0.421***
	(0.000)	(0.000)	(0.013)	(0.002)
Observations	42	42	42	42
Adjusted R^2	0.520	0.391	0.175	0.578

Notes: Robust p-values in parentheses. *** p<0.01; ** p<0.05; * p<0.1.

5.2. ECB shadow rates

The second robustness test reevaluates the adequacy of the short-term interest rate as an indicator of monetary policy. While the short-term interest rate is suitable as a measure of monetary policy stance in the early years of our study, potential concerns emerge for the later years of our horizon. This issue became particularly relevant as short-term interest rates neared the Effective Lower Bound (ELB), prompting the ECB to resort to unconventional monetary policy measures. To enhance the accuracy of our assessment for this later period, we incorporated an alterntaive measure of the monetary policy stance into our regression models. This was achieved by combining the 3-month Overnight Index Swap (OIS) rate with a *shadow rate*, which is an estimate of what the short-term rate might have been in the absence of a lower bound, inferred from broader yield curve patterns. In our study, we test for two shadow rates: one from Wu and Xia (2020) and the other from Krippner (2013), to represent the monetary policy stance in the euro area. Starting from 2012, we extend the 3-month OIS rate by applying the cumulative growth rates of each respective shadow rate.[8] The results, as reported in Table 3, are based on the Wu and Xia (2020) shadow rates and clearly confirm the baseline results. We have omitted the results pertaining to the Krippner (2013) shadow rates in our report, as they closely mirror the figures reported and do not provide any additional significant insights.

Table 3: Heterogeneity drivers using ECB shadow rates

	Impact	1-year	2-year	Peak impact
Durability	-0.607**	-1.055**	-0.926	-1.367***
	(0.018)	(0.039)	(0.176)	(0.004)
Non-necessity	-0.660***	-0.909***	-0.555***	-0.467***
	(0.000)	(0.000)	(0.006)	(0.001)
Observations	42	42	42	42
Adjusted R^2	0.469	0.432	0.174	0.464

Notes: Robust p-values in parentheses. *** p<0.01; ** p<0.05; * p<0.1.

5.3. Unweighted shock aggregation

Our third robustness test involves a modification in the aggregation of monetary policy shocks from monthly to annual observations. Unlike our baseline model, which employs a weighted approach that gives precedence to earlier shocks within the year, this test implies aggregating shocks annually without any weighting. This rather simple adjustment yields more pronounced

[8] The resulting policy rate indicators are reported in Appendix Figure A1.

variations compared to prior robustness exercises. The data in Table 4 reveals an increased economic significance for both dummy variables. This trend is also evident in the Impulse Response Functions (IRFs) detailed in Appendix Figure B3: the less sensitive categories as non-durable goods, services and necessities show responses at a comparable level, while the more responsive categories like durable goods and non-necessities show stronger reactions. Generally, the reactions using the unweighted shocks come in with a higher lag and are initially milder, also reflected with a significantly lower adjusted R-squared at impact—potentially underestimating shocks that occurred earlier in the year that could cause quick consumption responses at the end of the same year. Despite these differences, the core findings remain consistent: the durability dummy demonstrates greater economic significance, while the distinction of the necessity dichotomy is more pronounced with higher statistical significance.

Table 4: Heterogeneity drivers summing the shocks

	Impact	1-year	2-year	Peak impact
Durability	0.052	-1.282*	-0.890	-1.638**
	(0.929)	(0.089)	(0.335)	(0.043)
Non-necessity	-0.758***	-1.772***	-1.072***	-1.045***
	(0.002)	(0.000)	(0.001)	(0.000)
Observations	42	42	42	42
Adjusted R^2	0.069	0.434	0.175	0.361

Notes: Robust p-values in parentheses. *** p<0.01; ** p<0.05; * p<0.1.

6. Conclusion

Exploring the heterogeneous transmission of monetary policy, a plethora of studies looking at the heterogeneous transmission of monetary policy have enhanced our understanding by examining the different responses based on household characteristics such as liquidity, income level and type of mortgage loan. These studies have focused primarily on the consumer side, examining how different segments of the population respond to monetary policy changes. Building on this critical work, this paper looks at heterogeneous transmission patterns from a different perspective by closely analysing the effects of monetary policy on consumer goods, in order to shed light on heterogeneity from the perspective of the goods and services themselves.

The study highlights the pronounced sensitivity of durable goods to interest rate fluctuations, in alignment with existing literature and the underlying macroeconomic principle that

higher interest rates dampen consumption—particularly evident for more substantial purchases often financed through debt. In contrast, non-durable goods and services exhibit a notable resilience at similar levels.

By further breaking down consumption into individual components at the three-digit COICOP level, the paper offers a new level of granularity showing the heterogeneity across consumption items within the core consumption categories observed before. In a subsequent step, the re-aggregation of these components into new groups by necessity—a factor that is orthogonal to durability and thus exerts an independent influence—extends the analysis beyond the conventional durable versus non-durable dichotomy and compares the effect of necessity with the previously identified impact of durability.

Adding to the profound effect of durability—which exhibits the most substantial economic impact—the findings reinforce the notion that the necessity dichotomy is potentially more effective in determining whether various consumption goods and services are sensitive or resilient to monetary policy changes.

Based on these results, we build a bridge from the consumption goods and services to the households and their spending behaviour. Using data on expenditure shares for COICOP three-digit consumption items by various household characteristics, we find that the consumption baskets of high-income households and younger aged consumers are more responsive to monetary policy shocks.

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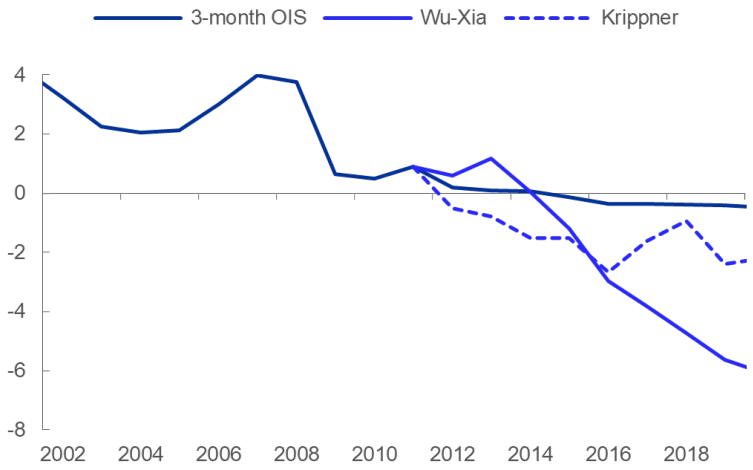
Appendix A. Additional figures and tables

Table A1: Consumption components by COICOP purpose

Number	*Consumption component*	*Durability*	*Necessity*
1	Food	Non-durable	Necessity
2	Non-alcoholic beverage	Non-durable	Necessity
3	Alcohol	Non-durable	Necessity
4	Tobacco	Non-durable	Necessity
5	Narcotics	Non-durable	Necessity
6	Clothing	Non-durable	Necessity
7	Footwear	Non-durable	Necessity
8	Actual rents	Service	Necessity
9	Imputed rents	Service	Necessity
10	Dwelling maintenance and repair	Mixed	Non-necessity
11	Dwelling water and services	Services	Necessity
12	Dwelling energy	Non-durable	Necessity
13	Furniture	Durable	Non-necessity
14	Household textiles	Non-durable	Non-necessity
15	Household appliances	Durable	Necessity
16	Household glass	Non-durable	Non-necessity
17	Housing and garden tools	Durable	Non-necessity
18	Household routine maintenance	Mixed	Non-necessity
19	Medical products	Non-durable	Necessity
20	Out-patient services	Service	Necessity
21	Hospital services	Service	Necessity
22	Vehicle purchases	Durable	Non-necessity
23	Transport equipment	Mixed	Non-necessity
24	Transport services	Service	Necessity
25	Postal services	Service	Necessity
26	Telephone equipment	Durable	Necessity
27	Telephone services	Service	Necessity
28	Audio-visual equipment	Durable	Non-necessity
29	Other cultural durables	Durable	Non-necessity
30	Other recreational items	Non-durable	Non-necessity
31	Cultural services	Service	Non-necessity
32	Newspaper and books	Non-durable	Non-necessity
33	Package holidays	Service	Non-necessity
34	Education	Service	Necessity
35	Catering	Service	Non-necessity
36	Accommodation	Service	Non-necessity
37	Personal care	Mixed	Necessity
38	Personal effects	Durable	Non-necessity
39	Social protection	Service	Necessity
40	Insurances	Service	Necessity
41	Financial services	Service	Necessity
42	Other services	Service	Non-necessity

Note: Education is at the COICOP two-digit level and is the sum of pre-primary and primary education, secondary education, post-secondary non-tertiary education, tertiary education and education not definable by level.

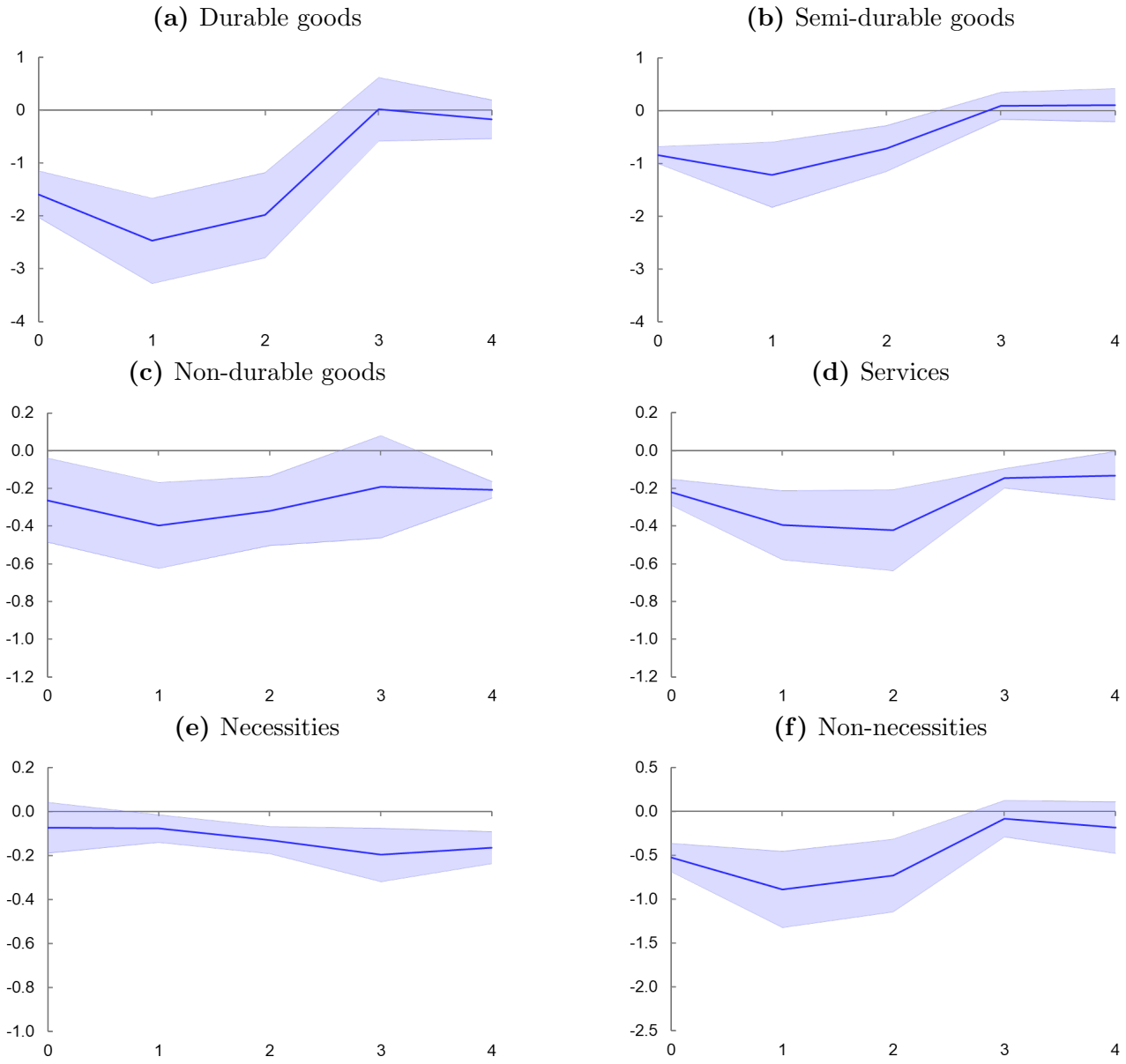
Figure A1: ECB shadow rates
(percentage)



Note: Figure A1 shows the 3-month OIS rate as well as two ECB shadow rates: Wu and Xia (2020) and Krippner (2013).

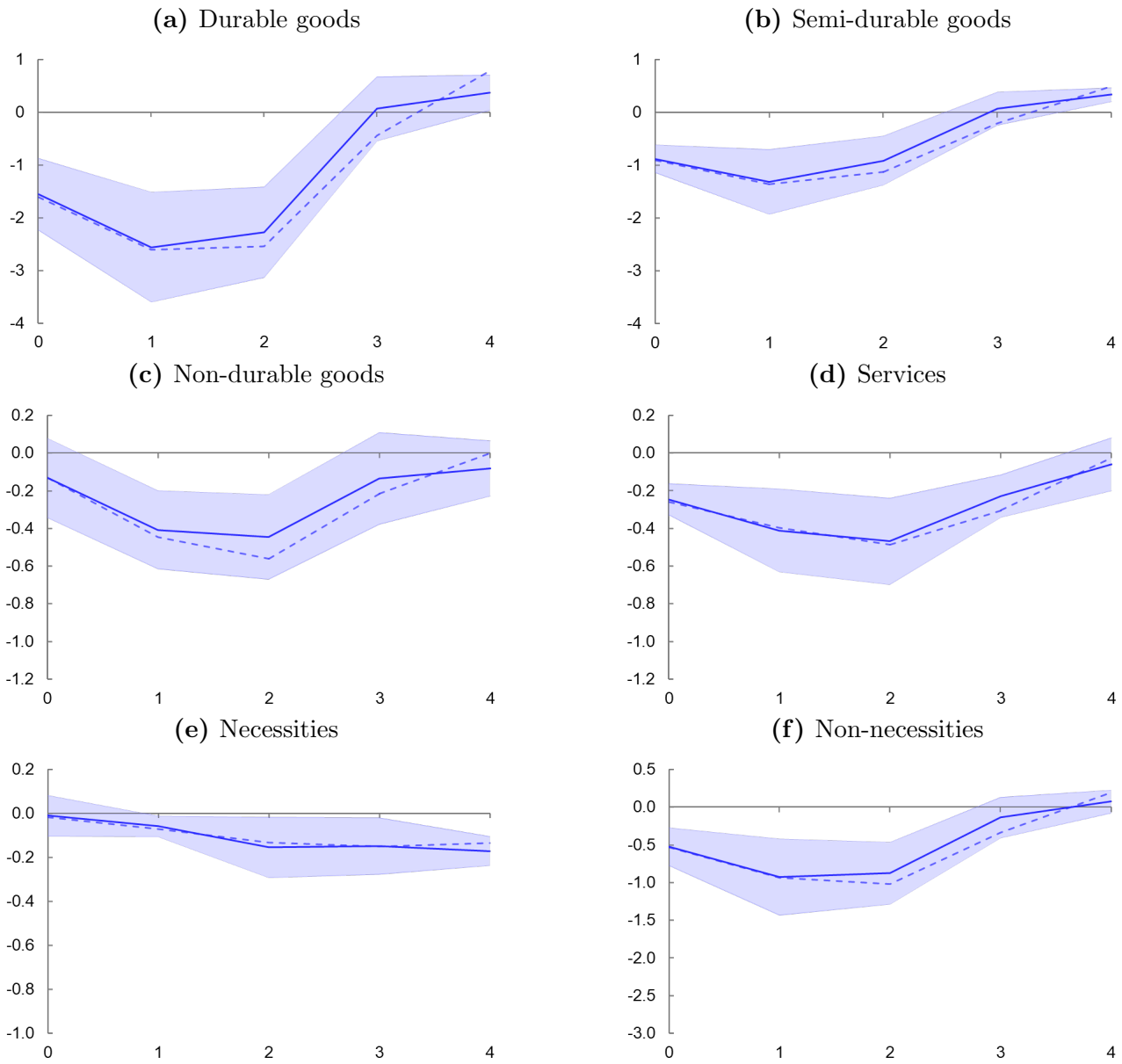
Appendix B. Robustness checks

Figure B1: Robustness: poor man's sign restrictions shock
(percentage)



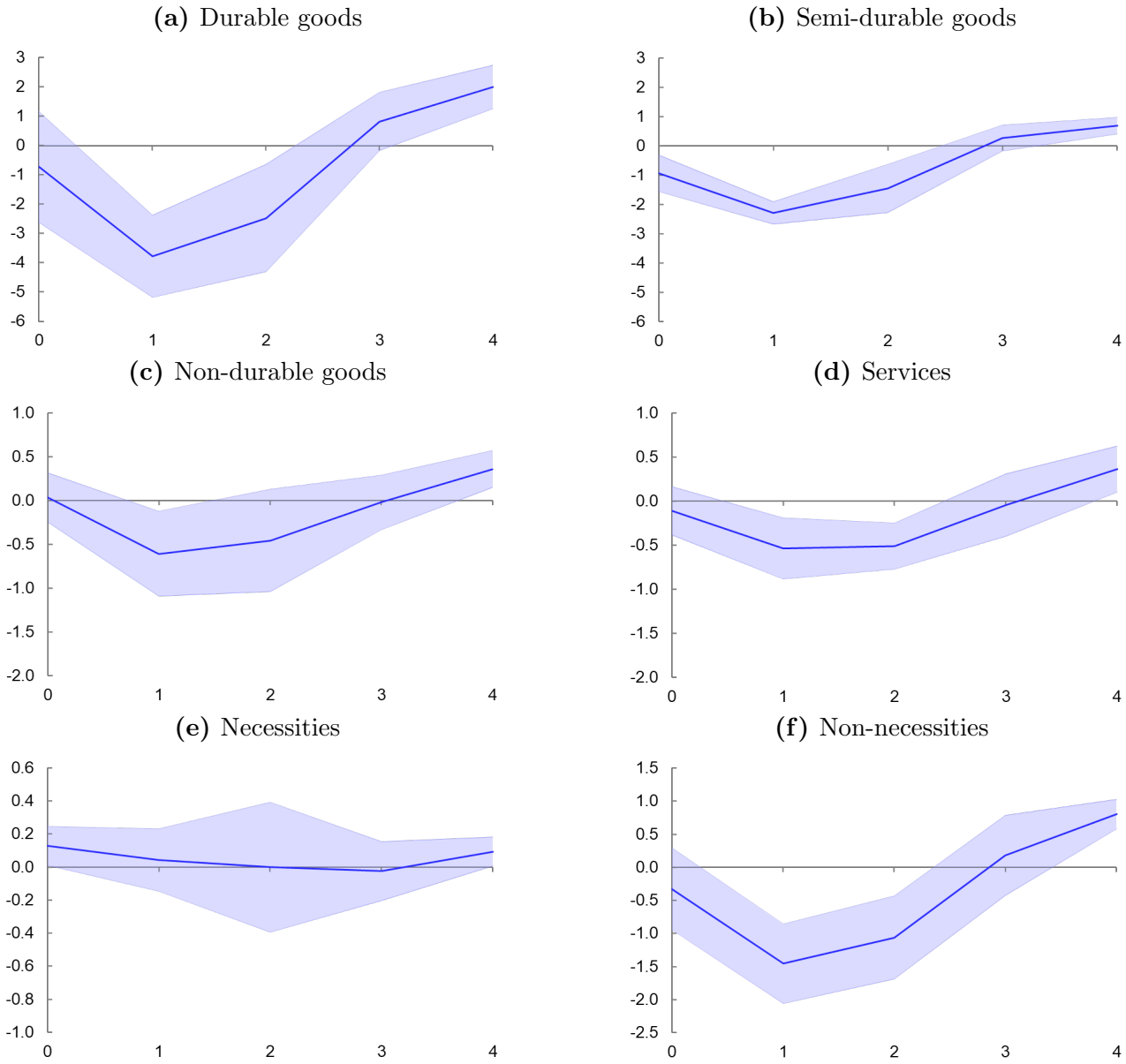
Notes: These charts report impulse responses to a 10 basis points monetary policy surprise tightening. The shaded areas represent 95% confidence bands, respectively, and the horizontal axes refer to the horizon of the IRFs (in years). The dotted lines in Panel B1f reports the reaction of luxury items.

Figure B2: Robustness: ECB shadow rates
(percentage)



Notes: These charts report impulse responses to a 10 basis points monetary policy surprise tightening. The shaded areas represent 95% confidence bands, respectively, and the horizontal axes refer to the horizon of the IRFs (in years). The blue lines show the Wu and Xia (2020) shadow rates; the dotted lines show the Krippner (2013) measure, for which the confidence were not included as they are very similar to the shown ones.

Figure B3: Robustness: unweighted summing of shocks
(percentage)



Notes: These charts report impulse responses to a 10 basis points monetary policy surprise tightening. The shaded areas represent 95% confidence bands, respectively, and the horizontal axes refer to the horizon of the IRFs (in years). The dotted lines in Panel B3f reports the reaction of luxury items.